

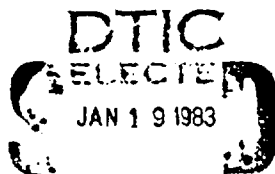
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ARMORED COMBAT VEHICLES

SCIENCE & TECHNOLOGY PLAN

NOV 1982

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ARMORED COMBAT VEHICLE SCIENCE & TECHNOLOGY PLAN

SECOND EDITION

NOVEMBER 1982

US ARMY TANK-AUTOMOTIVE COMMAND

RESEARCH & DEVELOPMENT CENTER

SYSTEMS & TECH PLANNING OFFICE

WARREN, MICHIGAN

48090

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Foreword

This is the second issue of the Armored Combat Vehicle Science and Technology Plan and is designed to present programs and objectives for FY1983 through FY2000. The Plan addresses RDT&E Technology initiatives as applied to the Army's armored combat vehicle projects. It has been developed assuming a reasonable level of funding and is depicted in terms of both technology and systems planning. This document will be the basis for establishing TACOM's management objectives and priorities for the DARCOM Long Range RD&A Plan and the Army's Science and Technology Program. Considerable interplay between documents is expected, particularly as the mission area analyses are completed.

The projects listed as applicable to each vehicle system are only provided to identify technologies and their availability. Final selection and scheduling for application is controlled by the system manager. It is expected in future editions to more succinctly identify each project as to whether it is being applied, being considered for application or is simply evolving with no firm application commitment.

→ The Plan is organized with the following four sections which tend to emulate the RD&A Plan:

1. Close Combat-Heavy;
2. Close Combat-Light;
3. Future Close Combat Vehicle (FCCV) Study, and
4. Supporting Technology.

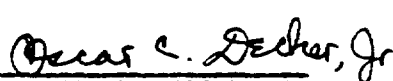
The first two sections are devoted to identifying technology applied directly to a combat vehicle or an identified combat vehicle system.

In the section on the FCCV Study we address the issues surrounding the formulation of combat vehicle system concepts based on threat projections, pacing technologies and operational concepts for the 1995-2000 year time frame.

Forward (cont.)

The last section identifies the supporting technologies generated by all the Commands involved in the S&T Program which are not posted as being applicable to a particular system. These include many generic projects that add to our general base of applicable scientific knowledge.

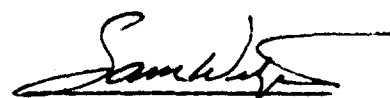
This will be a living document to be updated, commented on and/or changed on an annual basis. All concerned are encouraged to provide corrections and/or changes as they occur so that the Plan can be kept current. Any suggestions regarding ways to improve the Plan will be appreciated and be given due consideration.



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Preface

The following is a synopsis of the management structure for the Armored Combat Vehicle Science and Technology (ACV S&T) Base Development Program:

The Program Advisory Council (PAC) is a senior decision making body which is chaired by the Commanding General of TACOM. Its members are the Commanding General (CG) of the Armor Center at Fort Knox, KY, the CG of the Infantry School at Fort Benning, GA, and the Commanders or Technical Directors of DARCOM's major supporting commands. Senior user and developer advisors, Department of Defense (DoD) wide, are included as appropriate. These representatives have the authority to make decisions for their respective organizations and commit resources in support of the planned ACV S&T Base Program Activities.

The Systems & Technology Planning (STP) Office at TACOM provides a secretariat to coordinate the efforts of the Action Teams, the Systems Integration Team (SIT), and The Program Advisory Council. This office, in conjunction with the SIT, coordinates all inputs, prepares information for the PAC reviews and assures that PAC directives are fulfilled. It is this office which also provides logistical support to the ACV S&T Activity and sees to the preparation, printing and distribution of the plan and other ACV S&T program reports.

The Systems Integration Team (SIT) is chaired by the Chief of the Technology Planning Function in TACOM's STP Office. The SIT members are the chairpersons of the seven program Action Teams (Firepower, C³I, Support, Sensing, Mobility, Survivability, and Vetrionics) and user representatives from the Armor Center and Infantry School. Serving in a overview function, the SIT addresses issues which transcend individual Action Teams' areas of expertise and interest. This team usually prepares information for the PAC based on Action Team activities or PAC direction.

Each Action Team is comprised of technical experts drawn from throughout DARCOM and the DoD. These teams meet periodically as needed to support the PAC and SIT as a part of the annual ACV S&T cycle. They review all those R&D efforts which could influence long range Armored Combat Vehicle Development Programs. Based on this technical review and assessment, recommendations are made to the PAC relative to significant technological opportunities, and program deficiencies or gaps. The teams follow the guidance provided by the PAC and the chairperson of the SIT. Each team publishes a report describing the team's efforts for each cycle of the ACV S&T Program. This report becomes part of the consolidated report prepared by TACOM.

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The Armored Combat Vehicle Science and Technology Base Development program report and, now, the plan are annual products of the cycle. Once in place, their uses are manifold. Used as a source document by many different organizations DA wide, the report's primary use for the last two years has been in support of the DARCOM Research Development and Acquisition (RDA) Plan. It is now viewed as the major feeder document to the close combat portion of that DA prioritized plan. In future years, it is expected that this situation will remain as the ACV S&T Program continues its role of combat vehicle advocate within the Department of Defense. The plan is expected to encourage a forward looking focus. Allocation of resources through informed decision making in the ACV arena is expected to be expedited by the availability of this document.

C³I

FIREPOWER

MOBILITY

SENSING

SUPPORT

SURVIVABILITY

VETRONICS

Project Index

This project index is provided to give the reader a simple way to identify and locate projects within this plan and identify their interrelationships. Additionally, it provides an easily usable cross index to the DARCOM RDA Plan (May 1982 Edition) so that its relationship to all of the Army's technological initiatives can be identified. This index is alphabetized by S&T action area and by project title within each area. The index also provides cross indexing of projects by vehicle application and command responsibility.

An edge index is provided on the right to assist the user in finding projects within a particular Science and Technology category.

TITLE/DESCRIPTION

500 WATT VHF POWER AMPLIFIER

Boost output RF Power of AN/VRC-12 and SINCGARS-V radios from 40 watts to 500 watts. Provide increased communications range and ECCM capability.

ADAPTIVE VHF RADIO APPLIQUES FOR SINCGARS-V

Adaptive frequency selection and selective calling. Meteor burst applique for long range communications of burst voice and data adaptive power control.

ADVANCED TACTICAL POWER SOURCES

Control battery proliferation in DARCOM equipments and thus reduce field logistic problems.

ARMOR/AIR COVERT NET

Develop a Family of Millimeter Wave (MMW) radios providing covert "radio silence" communications capabilities for Armored Combat Vehicle (ACVH, ACVL, AIFV, SCV, etc...) or helicopter. MMW omni-directional/directional systems provide low probability of intercept minimal signature, jam and EMP resistant mobile communications in platoon scenarios to 1.5 Km.

ARMY TACTICAL FREQUENCY ENGINEERING PILOT SYSTEM (ATFES)

To provide a vehicle to reach potential battlefield spectrum management capabilities through operational evaluation during major USAREUR exercises, and to provide a "now" or "go to war" battlefield spectrum management asset which will be used during the period prior to the availability of the second generation Communications System Control Element (CSCE).

AUTOMATED CAD SYSTEM FOR LSI/VLSI CUSTOM CHIPS

To provide the Army and its contractors with a comprehensive set of computer aided design tools and techniques for the cost-affordable development of LSI/VLSI/VHSI circuits and hybrid subsystems.

DISTRIBUTED PROCESSING

Develop an overall system architecture for a C³ system based on distributed processing. The system will provide for high survivability and CONOPS, and will support the TRADOC Command Control Subordinate System (CCS²).

FAULT TOLERANT, FAIL-SOFT ELECTRONIC MODULES

To provide electronic modules containing on-chip circuitry to detect and correct logic faults, circumvent logic failures and redistribute functional assignments to optimize remaining logic elements.

C³I

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
CECOM	1X463707D437.00	10.4.26	A-5 B-5 C-5 D-9 E-3 F-5 G-3
CECOM	1L163701 AH92MO 1X463707D437.00		A-5 B-5 C-5 D-9 E-3 F-4 G-3
ERADCOM			H-3
CECOM	1X463707 D437.00		A-5 B-5 C-5 D-9 G-3
CECOM	1L162701 AH92		H-3
ERADCOM	1L1 62705 AH9404	13.6.5	H-2
CECOM	1L162701 AH92		H-3
ERADCOM	1L162705AH9404	13.6.2	H-3

TITLE/DESCRIPTION

IBER OPTIC TRANSMISSION SYSTEM (LOCAL DISTRIBUTION)

Replacement of CX-4566 (26 pair) cable with an optical cable system.

IBER OPTIC TRANSMISSION SYSTEM (LONG HAUL)

The FOTS(LH) will be compatible and interoperable with existing tactical digital communications equipment interconnected by CX-11230 twin metallic coaxial cable. This includes ATACS equipment, improved ATACS equipment, and selected TRI-TAC equipment. FOTS(LH) will be capable of operating over optical cable path lengths of from 300 meters to 6 kilometers without repeaters and up to 64 kilometers using no more than 10 repeaters.

FIST RADIO NET SIMULATION MODEL

To collect statistics on the FIST Radio Network. The model will be used as an analytical tool during the independent evaluation of the FIST-V System. An expanded version of the model will be used to evaluate the communication capability of the Advanced Field Artillery Tactical Data System.

FLAT PANEL ELECTROLUMINESCENT (EL) DISPLAYS

To develop reliable rugged lightweight, compact, solid state displays, capable of displaying full video and graphics legibly in light levels from total darkness to direct sunlight. Design goals include standard module configuration, built-in operator interactive touch panel and compatibility with Military Computer Family (MCF).

FREQUENCY HOPPING ANTENNA MULTIPLEXER

Antenna multiplexer similar to TD-1288/1289 for SINCGARS-V frequency hopping radios. Multiplexer will couple two or four radios to one antenna.

HANDHELD ENCRYPTION AND AUTHENTICATION DEVICE

Eliminate hard copy encryption/authentication and CEOI materials through the use of handheld encryption and authentication equipment.

HIGH POWER VHF VEHICULAR ANTENNA

Antenna to be used with TD-1288/1289 Antenna Multiplexers, Frequency Hopping Multiplexers, and 500 Watt Power Amplifier.

C³I

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
CECOM	1X463707 D246-09-48	5.6.9	H-2
CECOM	1X46701D487.35	5.6.9	H-2
AMSAA			H-3
ERADCOM			A-5 B-5 C-5 E-3 F-5 G-3
CECOM	1L163701 AH92MO 1X463707D437.00	10.4.7	A-5 B-5 C-5 D-9
CECOM	1E5334017749163		A-4 B-4 C-4 D-8 E-2 F-4 G-2
CECOM	1E463707 D246.11		A-5 B-5 C-5 D-9 F-5

TITLE/DESCRIPTION

AN ENGINEERING LABORATORY COMMUNICATIONS SURVEY

Netted radio traffic of an armored squadron under near-realistic maneuver conditions will be recorded and analyzed. The analysis will be multifaceted - to include transmission queuing statistics, transmit/ receive duty cycle data, static vs. on-the-move traffic characteristics, message content/ subject analysis, and operator characteristics/performance data.

HT ARMORED ELECTRONIC SYSTEM CARRIER (LAESC)

To supply a prime mover for CE/Intel Systems that will provide survivability, reliability, and mobility required to support the airland battle. The vehicle will provide NBC protection, on-board power, a quick erect antenna, and environmental control.

A COST LAND NAVIGATION

Improve the positioning and heading capability of combat vehicles with a moderate cost land navigator having an accuracy of 1% distance traveled and heading of less than 1 degree.

W PHASE NOISE CRYSTAL OSCILLATOR

Develop ultra high stability crystal oscillators which are also immune to vibration, permitting operation on moving platforms.

ROELECTRIC PACKAGING

Develop packaging capability compatible with high speed circuit operation.

LITARY COMPUTER FAMILY

To develop a standard family of computers and peripherals to satisfy the requirements of virtually all projected battlefield automated systems eliminating the proliferation of types.

LLIMETER WAVE (MMW) WIRELESS INTERCELL COMMUNICATION SYSTEM (WICS)

To develop tunable MMW radios capable of providing both covert DF and jam resistant mobile orderwire and stationary time division multiple access communication for local distribution within a dispersed command post. A prototype system (6 identical radios) for a self contained network (within one cell) will demonstrate a mobile voice and TDMA voice and data communication capability between shelters/vehicles within a 2Km cluster.

C³I

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
USAHEL			H-3
CECOM			E-3 F-5
MICOM			A-4 B-4 C-4 D-8 E-2 F-4 G-2
ERADCOM	1L162705AH9410		A-4 B-4 C-4 D-8 E-2
ERADCOM	1L162705AH9404		H-2
CECOM	D186, D187, AD94		B-5 C-5 F-5 G-3
CECOM	1L162701AH92M0		D-8 F-4 G-2

C3I

TITLE/DESCRIPTION

MILLIMETER WAVE MULTICHANNEL COMMAND POST RADIO (MCPR)

Develop light weight, portable MMW multichannel radio system to: Reduce visual/RF signatures, vulnerability to ECM, EMP, jamming, supplement or replace cable systems, interface with ATACS PCM equipment.

MODULES FOR TECHNOLOGY INSERTION

Provide unique chips and brassboards modules for nearly all classes of Army Systems including Radar, E-O, AD, Communications, Missiles and EW.

NETWORK MANAGEMENT INTEGRATION - BATTLEFIELD INFORMATION DISTRIBUTION TECHNOLOGY

The objective is to develop a coherent distributed Network Management (NM) structure (algorithms, protocols, and architectures) for the emerging Battlefield Information Distribution (BID) concept.

NONELECTROMAGNETIC COMMUNICATIONS

Provide communication capabilities which cannot be jammed and with high survivability under hostile shelling.

NUMERICAL ELECTROMAGNETIC CODE

The program consists of several theoretical studies: Platform Effects on Tactical Communications, Proximity Effects on Low Profile Antennas, Antennas with Buried Ground Radials. Computer code will be developed on antenna theory and will be used in computer aided design of antennas on tactical vehicles and at base stations.

OBJECTIVE HF RADIO (OHFR)

Develop adaptive HF radio system with ECCM and data modems for rates up to 2.4 kbps, automated frequency management and automatically tuned antennas. Radios will be developed for manpack, vehicular and aircraft platforms.

POWER SOURCES/ADVANCED TACTICAL POWER SOURCES

Develop high rate, high energy density (2-3 times present lead-acid batteries), cost effective, rechargeable batteries to overcome operational deficiencies and life cycle problems of present batteries for combat vehicles in low temperatures environments.

RADIO WAVE PROPAGATION PREDICTION

To evaluate Radio Wave Propagation Models.

C³I

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
CECOM	1E463707D246.08		D-8
ERADCOM	1L162705 AH9404	13.6.4	A-5 B-5 C-5 D-9 E-3
CECOM	1L162701 AH92S0		H-3
HEL			H-3
CECOM	1L1611102 AH48N0		H-2
CECOM	1L162701AH92NB		A-4 B-4 C-4 D-8 G-2
ERADCOM	1L162705AH94-11 1L263702DG10-11		A-4 B-4 C-4 D-9 E-2 F-4 G-2
AMSAA			H 3

C³I

TITLE/DESCRIPTION

SINGLE CHANNEL GROUND AND AIRBORNE RADIO SUBSYSTEM (SINCGARS)

The SINCGARS-V Radio will replace the currently standard vehicular, and manpack. The AN/VCR-12 family and AN/PRC-77.

SINGLE CHANNEL OBJECTIVE TACTICAL TERMINAL (SCOTT)

SCOTT will provide mobile, jam resistant, extended range and single channel communications to high priority users of the Tactical Record Traffic System, from Theatre to Brigade.

SMALL UNIT RADIO

Replacement radio for AN PRC-68. Limited ECCM capability using direct sequence. New frequency band of operation. Low cost and maintenance using large scale integrated circuits.

SOS FREQUENCY SYNTHESIZER

To develop a minimum set of frequency synthesizer chips required for agile frequency synthesizers for HF, VHF, AND UHF communications and data link applications.

SPREAD SPECTRUM LPI TECHNOLOGY - BATTLEFIELD INFORMATION DISTRIBUTION TECHNOLOGY

The objectives are to develop improved ECCM/LPI capability for spread spectrum Battlefield Information Distribution Systems and exploit distributed net management concepts to improve survivability through adaptive AJ technique.

TACTICAL POWER SUPPLIES (1.5 KW TEG)

Provide silent, multi-fuel thermoelectric (TE) converters, burner systems, cooling systems for tactical TE power generators for SLEEP* ROC family of 0.5, 1.5, 3.0, 5.0, 10.0 KW power plants and for Integrated Power Environment Control Systems (IPECS) to provide electric power, heating and cooling for on-board shelter mounted C³ system.

UHS (1-2 GHz) FREQUENCY SYNTHESIZERS, UHS PRESCALERS

To develop 1-2 GHz frequency synthesizers using GaAs digital technology. Develop critical circuits required for the synthesizers through development of GaAs Array technology, CAD tools, HEMT (high electron mobility) circuits. Objective is to obtain enhanced ECCM which required higher processing speed than that which is obtainable from silicon technology.

C³I

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
CECOM	6.37.46A D555	10.8.2 10.8.11 15.13.2 15.14.2	A-4 B-4 C-4 D-8 E-2 F-4 G-2
USASATCOMA	1X433142D456		E-3
CECOM	1X463707D437.00		F-5 G-2
ERADCOM	1L1 62705 AH9404	13.7.1	A-4 B-4 C-4 D-8 E-2 F-4 G-2
CECOM	1L162701AH9280	10.4.2	H-2
ERADCOM	1L162705 AH9411		A-5 B-5 C-5 D-9 E-2 F-4 G-3
ERADCOM	1L1 62705 AH9404	13.7.1	H-2

c3i

TITLE/DESCRIPTION

ULTRA HIGH SPEED (UHS) SIGNAL PROCESSORS AND 5-30 GHz PRESCALERS

Develop UHS Signal Processor capability for 1-5 GHz range (beyond VHSIC) using GaAs. Develop advanced network processor architecture CAD design tools for UHS in conjunction with synergistic DARPA/ARMY program. Develop UHS counters and prescalers for Multigigahertz front-end processing.

VEHICLE COMMUNICATIONS CAPABILITY IN MOBA/MOUT

Establish communications capability of tactical vehicles in built-up areas. Include capability of moving vehicle to moving vehicle (to stationary vehicle, to foot patrol, to positions inside structures) communications.

VEHICULAR INTERCOMMUNICATION SYSTEM

Improved earphones and noise channel characterization measurements suitable for UHF spread spectrum communications in ground environments characterized by varying terrain, foliage, and urbanization.

VHSIC PHASE 1 CHIP SET

Demonstrate brassboard subsystems for key selected programs utilizing Very High Speed Signal Processing Chips based on 1.25 um design rules.

VHSIC PHASE 2 CHIP SET

To provide system demonstrations of the Phase 1 brassboards, enhance the producibility and availability of the Phase 1 chip set, and to increase the complexity-speed-density figure of merit of the VHSIC 1 chip set by 20 times.

VHSIC PROGRAMMABLE ANTI-JAM MODERN-BATTLEFIELD INFORMATION DISTRIBUTION TECHNOLOGY

The objectives are to explore new robust adaptive AJ concepts and to demonstrate the real time capabilities thereof via implementation and demonstration of a VHSIC programmable modem brassboard or subsystem operating with PLRS, JTIDS, Low Cost Anti-Jam Data Link and potential BID waveforms, in various jamming environments and in support of future distributed network architectures, and to integrate into test bed for evaluation of advanced ECCM.

VHSIC SIGNAL PROCESSOR INSERTION IN PJH - ADVANCED COMMUNICATIONS CONCEPT DEVELOPMENT

The objective is to exploit the benefits of cost savings, size and Signal Processing capabilities derived from the VHSIC Program by providing early technology insertion of VHSIC Signal Processing chips into the PLRS/PJH Programs.

C³I

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	1L1 62705 AH94.04	15.13.8 5.8.15 3.4.13 5.8.8	H-2
HEL	1L162716AH70-F0		H-2
PM SINGARS	1X463746D5550104		A-4 B-4 C-4 D-8 E-2 F-4 G-2
ERADCOM	63452 F956	13.5.1	A-4 B-4 C-5 D-9 E-2 F-5 G-3
ERADCOM	63452 F956	13.5.2	A-4 B-4 C-4 D-8 E-2 F-4 G-2
CECOM	1L162701 AH92S0	10.4.31	H-2
CECOM	1X463707D437.00		F-5 G-3

TITLE/DESCRIPTION

DEBAND PROPAGATION MEASUREMENT PROGRAM

Plan and conduct wideband channel characterization measurements suitable for UHF spread spectrum communications in ground environments characterized by varying terrain, foliage, and urbanization.

C³I

COMMAND

PROJECT NO.

DARCOM PLAN PARA NO.

ACV S&T PLAN PG NO.

CECOM

1L162701AH92PO

H-2

FIREPOWER

TITLE/DESCRIPTION

ACCURACY EFFECTS

Gain the technology to predict and ultimately improve the accuracy of gun/projectile systems. Near term objective for tank-investigation sources of "jump" in tank guns and pursue methods of mitigation.

ACV-L REMOTE SENSOR PACKAGE

Develop remote sensor package to maintain commander's overwatch and gunner's target serving capability on armored combat vehicles employing an elevated gun and one-man turret.

ADVANCED COMMANDER'S VEHICLE SIGHT (ACV-I)

Provide automatic cueing and second generation FLIR in M1 tank for upgrading commander's performance in target acquisition and positioning.

ADVANCED GUNNER'S SIGHT

Provide automatic cueing and second generation FLIR in M1 tank for upgrading gunner performance in target acquisition and positioning.

ADVANCED IR IMAGING SEEKER AND AUTONOMOUS ACQUISITION

Establish technology base in advanced IR imaging seekers utilizing LWIR focal plane arrays and advanced imaging processing to evaluate IR imaging seeker technology for a variety of applications. Develop autonomous acquisition algorithms for lock-on after launch (LOAL) missile concepts.

ADVANCED LOVA PROPELLANT TECHNOLOGY

Develop new propellant formulations which will provide substantial improvements in survivability to such threats as shaped charge jets and fragment impact.

ADVANCED MILLIMETER OR RF SEEKER FOR LAND COMBAT

Develop a second generation seeker design for land combat (ground and air) applications with a target recognizer and test.

ADVANCED MULTI-PURPOSE ARMAMENT SYSTEM (AMAS)

Develop a lightweight combat vehicle with the following capabilities: Air transportable in a C130 and C141 aircraft, capable of defeating main battle tanks. Maximize survivability and minimize training and logistic burdens.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV SET PLAN PG NO.</u>
ARRADCOM (BRL)	1L162618AH80		H-5
ERADCOM	6.37.10A, DK87-01		C-9
ERADCOM	6.37.10A DK87-01		B-8A F-6A G-10A
ERADCOM	6.37.10A DK87-01		B-8A G-10A
MICOM			H-5
ARRADCOM (BRL)			A-6 B-9
MICOM			A-6 B-9
TACOM	1W463635D166		H-6

IREPOWER

TITLE/DESCRIPTION

ADVANCED MULTI-SENSOR GUNNER'S SIGHT

Develop Multi-Sensor target acquisition system for an enhanced anti-armor capability. Exploit mm wave radar combined with an advanced FLIR sensor for long range target acquisition and anti-armor missile guidance through degraded weather.

ADVERSE ENVIRONMENT SEEKER DESIGN

Determine the MMW seeker alternatives to imaging infrared seekers for HELLFIRE. Define candidate adverse environment seekers which match the HAWFCAR radar performance.

ALL VISIBILITY TARGET ACQUISITION FOR COMBAT VEHICLE

Develop MMW radar technology to complement thermal imaging systems to provide all weather target acquisitions for both moving and stationary targets.

ANTI-ARMOR MISSILE SYSTEM OPTIMUM DESIGN

Develop design data relative to launcher in-tube flow.

APPLICATIONS FOR MATERIALS

Crack arrest data for bainetic 4140 steel and preliminary data on the heavy metal. Accrue technical data on the fracture properties of heavy metals and composites. Analyze the texture data. Obtain predictive method to custom tailor shaped charges. Strengthen studies of U-Ti and U-Nb alloys initiated. Finalize U-Ti and U-Nb alloy processing study. Characterize material for ballistic performance testing. Perform polynary uranium alloy processing studies.

ARMAMENTS SYSTEMS CLOSE COMBAT-HEAVY

Formulate a need for and a concept for a fire and forget tank fire projectile. Formulate a baseline configuration and demonstrate technical operational feasibility of a tank-fire--fire and forget projectile.

ARMORED COMBAT VEHICLE TECHNOLOGY

Study the feasibility of using one gyro/accelerometer transducer package and computer by combining similar components from within gun stabilization and fire control systems. Study the effect of increased gun unbalance on gun pointing accuracies.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	6.37A DK87-01		C-103
MICOM			H-4
ERADCOM	6.37.10A DK70-13	11.11.7	A-8 B-8 G-5
MICOM		2.5.18	C-6 D-10 G-8
ARRADCOM	6.2/AH19		H-5A
ARRADCOM			A-8 B-8 G-5
TACOM	1L263602D188		H-6

FIREPOWER

TITLE/DESCRIPTION

ASLAV

Provide a lethal kinetic energy warhead in a package consistent with burdens acceptable to light armored vehicles. Explore reduced impulse launch technology for mounting high lethality gun armament systems on relatively light armored vehicles. The 105 SLR Gun will be demonstrated on a light tracked vehicle. Further refinements to the armament system will be made in an exploration of techniques for maximizing the lethality and system performance of armament on light armored vehicles.

AUTONOMOUS ACQUISITION ALGORITHMS AND PROCESSORS

Develop an automatic acquisition/guidance capability for self contained munitions through the development of algorithms and processors for use with imaging sensors.

BALLISTIC MODELING OF SMART PROJECTILES/DEVELOP FIRE & FORGET WEAPONS FOR POINT TARGETS

Develop target detection model using IR, passive millimeter wave and active millimeter wave sensor. Calculate system performance for IMAAW/STAFF. Study the elimination of background clutter and false target description.

BALLISTIC TECHNOLOGY/PENETRATORS

Develop a fundamental understanding of penetrator mechanisms, materials and geometries that can be used to develop superior armor penetrating munitions in the future.

CHASSIS WEAPON INTERACTION

Develop an accurate model and total vehicle simulation of chassis/turret interaction dynamics to estimate, predict, and experimentally obtain chassis motion disturbance inputs to the gun/turret drive servo systems, and subsequently develop effective chassis motion disturbance cancelling techniques.

CLOSE COMBAT LASER ASSAULT WEAPON (CCLAW)

(Project description is classified CONFIDENTIAL.)

CO₂ LASER RANGEFINDER

Develop CO₂ laser rangefinder integrated into M1 tank with a ranging capability complementary with thermal imager performance even under moderately adverse atmospheric conditions, including fog, haze, dust, and smoke.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM	6.2/AH18		F-6A G-10A
MICOM			C-8A D-11 G-10A
ARRADCOM		18.5.6	H-5
ARRADCOM	1L162618AH80		H-5
TACOM			H-4
MICOM	1L263314D057		H-6E
ERADCOM	6.37.10A DK87-06	9.9.22	B-6 G-10 F-6

FIREPOWER

TITLE/DESCRIPTION

COMBAT VEHICLE ANTI-ARMOR

Improve Gun-Launched KE ROD by reducing sabot weight, employing MOD25M30 propellant at higher pressure, and increasing L/D ratio to improve penetration and reduce drag. Validate small-scale high L/D rod data with soft-launched rods. Demonstrate full-scale composite KE rods for tank guns. Design and test full-scale soft-launched rods. Optimize flight performance of most suitable soft-launched rods. Integrate soft-launched rods with missile carrier. Support systems development of tank gun KE rods. Evaluate materials technology for future generation of KE Penetrators. Test elongated fragment forged by non-axisymmetric warhead. Design and test inductive fuze. Integrate elongated forged fragment with missile carrier. Fabricate and begin test of full scale fly-over, shoot down forged fragment system. Design 150MM Hemispherical (Tandem) HEAT WARHEAD. Demonstrate cold-pressed explosive fill for 105MM HEAT. Conduct full-scale static test of 150MM HEAT. Conduct rocket sled test of 150MM HEAT using advanced hemispherical liner and pressed explosive.

COMBAT VEHICLE ARMAMENT SYSTEM TECHNOLOGY (CFAST)

Provide Lightweight Combat Vehicles with the capability to effectively engage future and follow-on BMP vehicles through application of technologies to improve P_h and penetration capability against improved armor. CFAST will accomplish the desired goal through utilization of modular full solution fire control subsystem and other armament advances including APFSDS ammunition, corrected trajectory projectiles, improved feed mechanisms, self-contained munition technologies, advanced propulsion techniques, etc. Turret integration effort will be concluded more rapidly. A high impulse weapon will be designed, fabricated, installed, and tested. High impulse weapon will be expedited.

COMBAT VEHICLE TECHNOLOGY/ELEVATED KINETIC ENERGY WEAPON PROGRAM

Design and fabricate a technology demonstrator to evaluate a combat vehicle mounting a kinetic energy cannon on variable height trunnions permitting firing from defilade positions, while using natural terrain for protection and concealment.

COMPOSITE COMPONENTS FOR ARMAMENT

Reduce total weight of armament systems by judicious replacement of metal components with organic matrix composites and to improve projectile performance by replacing metallic sabots with composite sabots.

COMPOSITE MATERIALS FOR SABOT APPLICATIONS

Determine the applicability of using composite plastic material for sabots in a wide range of ammunition.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM	6.3A, D223		A-8A B-8A
ARRADCOM	1L162617AH19		C-8 E-4
TACOM			G-9
AMMRC	1L162105AH84		A-7 B-7 G-6
ARRADCOM			H-5

FIREPOWER

TITLE/DESCRIPTION

CONSOLIDATED PROPELLANTS FOR HIGH VELOCITY AIR DEFENSE ROUND

Maximize the performance of a representative current state-of-the-art automatic cannon using consolidated propellants.

CONTROL SYSTEM DEVELOPMENT (ATAADS)

Provide low cost control systems with large force to weight ratios for FOG-M, shoulder launched and hypervelocity missiles, and for affordable submunitions.

CONVERSION COATINGS FOR DEPLETED URANIUM

Develop conversion coatings for environmental protection of depleted uranium alloy penetrators.

CORRECTED TRAJECTORY PROJECTILE

Develop a system to track target and projectile in flight, predict miss, calculate and transmit correction to projectile which then executes the correction for the purpose of increasing first round hit probability.

CORRELATION OF URANIUM ALLOY AND MECHANICAL PROPERTIES WITH BALLISTIC PERFORMANCE

Obtain subscale ballistic performance data for processed U-3/4 Ti and polynary alloys and to correlate with processing procedure and mechanical properties.

CORROSION AND PROTECTION OF TUNGSTEN ALLOYS FOR KE PENETRATOR APPLICATIONS

Assess the corrosion behavior of tungsten alloys for kinetic energy penetrator application and to develop protective coating for 10-20 year storage life requirement.

DAMAGE ASSESSMENT CONCEPTS

Formulate concepts for an assessment of damage resulting from a hit on target to determine whether additional round expenditure is required utilizing existing or near term sensor technology which will be available in combat vehicles.

DEVELOPMENT OF HIGH DENSITY COMPOSITE PENETRATOR

Develop a class of tungsten wire reinforced uranium composite material for penetrator application. Make determinations in areas of material design, processing, characterization, and penetrator proof test and to define and carry out a development program properly phased for this purpose.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM (BRL)	1L162618AH80		A-7 B-7 G-6
MICOM		4.5.11	C-6 D-10 G-8
AMMRC	1L62105AH84		A-7 B-7 G-6
ARRADCOM	AH19-F	17.8.6	B-6
AMMRC	1L62105AH84		B-8
AMMRC	1L62105AH84		A-6 B-9 G-7
ARRADCOM	AH19	17.8.3	H-6A
AMMRC	1L263102D071		A-8 B-8A

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FIREPOWER

TITLE/DESCRIPTION

DEVELOPMENT OF IMPROVED VERY HIGH BURNING RATE PROPELLANTS

Develop propellants with very high burning rates and structural strength characteristics sufficient to withstand high dynamic loads.

DYNAMIC MUZZLE SENSING

Provide a means of detecting and compensating for motion of the gun tube muzzle in a dynamic environment due to tube flexure thereby coupling the gun muzzle to the LOS for optimal fire initiation.

ELECTROMAGNETIC PROPULSION

Achieve hypervelocity (3000-6000 meter per second) with armor piercing kinetic energy projectile for enhanced penetration through electromagnetic propulsion while not sacrificing fire control, rate of fire, mobility or supportability requirements.

ENERGY MANAGEMENT

Provide solutions to problems encountered in using smokeless propellants in technical missile propulsion systems. Perform specific studies to optimize side-exhaustive nozzles, to explore energy management techniques providing soft launch capability in a single flight motor, propellant extinguishment techniques, boost/sustain thrust ratios, and lower limits of operation.

FIBER OPTICS GUIDANCE DEMONSTRATION (FOG-D)

Demonstrate the possibility of fiber optics guidance for missile applications.

FIBER OPTICS GUIDED MISSILE (FOG-M)

Develop prototype test missile and demonstrate closed loop target acquisition and tracking during flight test using a fiber optic data link. Demonstrate feasibility of both ground and helicopter launch, to include a vertical launch mode.

FIRE CONTROL FOR HIGHLY MOBILE COMBAT VEHICLE OPERATIONS

Increase effectiveness in acquiring and engaging multiple maneuvering target under "dirty" battlefield conditions while on the move.

FIRE CONTROL/WEAPON SYSTEMS INTEGRATION

Integrate fire control technological efforts into demonstratable systems for future applications and product improvement for existing systems.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM			G-9
ARRADCOM	AH19		F-6A G-10A
ARRADCOM	1L662603AH18 +DARPA G10 62702E	19.7.1	G-10
MICOM		2.5.22	H-6A
MICOM			H-5
MICOM		9.9.9	C-8 D-12 G-4
ARRADCOM	2.7.1 17.8.1	17.8.4	G-10
TACOM	1L263631D014		H-6

FIREPOWER

TITLE/DESCRIPTION

FOG PROCESSOR

Develop a photonic computer for target acquisition, cueing, automatic tracking, and discrimination for FOG (Fiber Optics Guided) missile. Demonstrate the application of the optical computer to reduce the operator's workload, by providing an auto-cueing to targets of interest, and an automatic track to impact if so desired.

FORWARD AREA LASER WEAPON (FALW)

(Project description is classified CONFIDENTIAL.)

FULL SCALE DYNAMIC SIMULATION

Develop a total tracked vehicle simulation of chassis/turret interaction dynamics and laboratory testing techniques to estimate, predict, and experimentally determine chassis motion disturbance inputs to the gun/turret drive servo systems. The dynamic interactions between the turret servo systems and vehicle chassis compliance, and track and gun tube vibrations which constitute the most serious disturbance inputs affecting the performance of the total combat vehicle system will be modeled, tested, and analyzed. The gun positioning error will be related to these disturbance inputs and system trade-off and error budget analyses conducted. These will be used to determine and quantify vehicle/weapon and man/vehicle/weapon interaction dynamics, limitations and performance requirements necessary to maintain target pointing accuracy as a function of terrain type, suspension level, horsepower, maneuver and turret control system. The Dynamic Analysis and Design System modeling method will be the theoretical basis for the analytical effort and TACOM's motion base and ride dynamics simulation facility will be the primary source of experimental data for model validation and proof of principal purposes.

FULL SCALE SYSTEM SIMULATION

Support and accelerate advanced development of Combat Vehicle Component Concepts resulting from TACOM and other government agency basic and applied research and industrial IR and D efforts. The mechanism by which the above will be accomplished is laboratory and field hardware-in-the-loop experimental testing. Combat vehicle subsystem performance tests will be conducted in the laboratory to identify and quantify component operational characteristics and their contribution to the total system capability. In support of the above, the following approach will be initiated: (1) Utilize HIMAG & HSTIV-L as research tools to advance Fire Control/Weapon system development, (2) conduct technology product demonstrations of gun/turret positioning systems and target acquisition and engagement components, and (3) optimize man/machine interface devices and controls.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
MICOM			G-4
MICOM	1L263314D056		H-6B
TACOM	AH91	2.4.42	H-6B
TACOM	D014	2.4.42	H-6B

FIREPOWER

TITLE/DESCRIPTION

FUNDAMENTALS OF SENSITIVITY/VULNERABILITY INSENSITIVE HIGH EXPLOSIVES AND PROPELLANTS

Provide explosive/propellant formulations less sensitive/vulnerable to detonation/ignition by enemy action, setback, fire, hot gun tubes.

GUNNER RESPONSE TO WEAPON RECOIL

Assess the effects of firing recoil on gunner's performance and to develop gunner station design requirements which will minimize the effects of firing recoil.

HELAST/DEVELOPMENT AND ASSESSMENT OF FIRE CONTROL SYSTEMS FOR COMBAT VEHICLE SYSTEMS

Describe system performance requirements for combat vehicle fire control systems which enable more effective gunnery performance against tactically behaving targets under more realistic battlefield conditions.

HIGH DENSITY KINETIC ENERGY PENETRATOR MATERIALS

Develop high density cemented tungsten alloys with superior reproducible ballistic mechanical properties to defeat monolithic and composite multiple armor targets at high angles of attack and extreme ranges.

HIGH PERFORMANCE COMBAT VEHICLE STATIONARY PLATFORM FIRE CONTROL

Develop and demonstrate fire control subsystems which enhance the engagement of both stationary and dynamic targets from a stationary platform.

HIGH VELOCITY AT-MUNITIONS

Evaluate igniter design, sabot and slug designs for energy, velocity increases. Demonstrate energy gains at target in $\frac{1}{4}$ scale prototype round. Establish baseline aeroballistic performance. Establish full scale projectile/gun requirements. Evaluate igniter design, sabot and slug designs for energy, velocity increases and demonstrate the energy gains at target in $\frac{1}{4}$ scale prototype round.

HIGH-ENERGY EXPLOSIVES & PROPELLANTS/FORMULATION OF HIGH FORCE PROPELLANTS

Provide higher-forced propelling charges to enhance kinetic energy penetration performance in anti-tank applications.

HYDROSTATIC EXTRUSION OF TUNGSTEN ALLOYS

Develop warm hydrostatic extrusion process and extrude uncracked, brittle tungsten alloy with superior mechanical properties. Test extruded billets for ballistic performance.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NC.</u>
ARRADCOM	AH 60/AA AH 18/UA		H-4
HEL			H-6
HEL		17.8.4	H-4
AMMRC	1L162105AH84		A-8 B-8 G-5
ARRADCOM		17.8.7	A-6 B-9 G-7
ARRADCOM	6.2/AH80		B-8A G-10A
ARRADCOM	AH 60/AM AH 18/UB	19.6.1	A-7 B-7 G-6
AMMRC			A-8A B-8B

FIREPOWER

TITLE/DESCRIPTION

HYPERVELOCITY PENETRATION INVESTIGATIONS

Determine experimentally the armor penetration hypervelocity payoffs for a variety of novel penetrator and advance armor designs.

IMPROVED 105-MM APFSDS-T

Demonstrate an improved 105-MM APFSDS-T round that will give the M1, M60A1, M60A3 tanks the ability to defeat the postulated Soviet armor threats through the 1990's.

IMPROVED CONVENTIONAL ARMAMENT SYSTEM

Provide final conceptual armament systems and preliminary system geometry decisions. Provide component testing. Develop technology demonstrator (test bed) for a tank armament system clearly adequate to the task which will be assigned. Provide an armament system for integration into TACOM Future Close Combat Vehicle (FCCV) test bed activities in the FY87 timeframe.

IMPROVED NON-STANDARD CONDITION SENSOR

Develop, fabricate, and evaluate sensors for the measurement of non-standard conditions associated with accurate engagement such as air temperature, air density, grain temperature, and tube wear. These sensors will eliminate the need for manual input of such data into the fire control ballistics solution.

IMPROVEMENT OF GUN TUBES FOR REDUCED WEAR AND EROSION

Improve the wear and erosion of gun tubes so that high performance armor systems such as ICAS can be developed with a war life of 250-500 rounds.

INDEPENDENT COMMANDER'S THERMAL VIEWER

Develop an affordable thermal viewer that will provide the M1 commander with an independent target acquisition capability to enhance the target servicing capability of the M1 weapon system.

INERTIAL COMPONENT DEVELOPMENT (ATAADS)

Develop a low cost, solid state, thin film transistor accelerometer with a dynamic range of 10^6 . This accelerometer could be combined with the micro-optic gyro in the development of a solid state IMU. Develop a low cost, solid state passive micro-optic laser gyroscope that can operate in a 1000 deg/sec environment with a drift of 1 deg/hr. Develop and deliver a vibrating beam accelerometer using a miniature resonator having an overall length of one inch and a diameter of one inch.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM (BRL)			H-4
ARRADCOM			A-7 B-7 F-6 G-6
ARRADCOM		2.5.23	B-8 G-9
ARRADCOM	AH19		E-4 F-6A G-10A
ARRADCOM		19.5.1	B-6 G-7
ERADCOM	6.37.10 DK87-01	11.11.5	B-6
MICOM		3.4.17	A-8 B-9 C-6 D-10 E-4 F-6 G-8

FIREPOWER

TITLE/DESCRIPTION

INFRARED SEEKER/SENSOR TECHNOLOGY

Develop a lower cost advanced scanning FPA seeker operating in the 8-10u band. Provide a fire and forget, day/night operational capability for application to HELLFIRE and FOG-M. Demonstrate commonality applications to Air Force and Navy weapons. Define a Joint Service Seeker development effort with the other services as a follow-on to JSS. Utilize VHSIC electronics technology for seeker packing to missile configuration.

INTEGRATED OPTICS (6.1 RESEARCH IN MSLS AND HEL)

Develop and demonstrate practical integrated circuits (as opposed to conventional elements) for visible, IR, and submillimeter sensor seeker systems applicable to brilliant weapons.

INTEGRATED PROCESSING SYSTEM

Provide computational capacity required for auto track, maneuvering target prediction, auto-cue, digital control and stabilization, ballistics within volume constraints of combat vehicle.

IR SEEKER FOR TERMINALLY GUIDED WEAPONS

Demonstrate by captive flight tests and by simulations or analysis an infrared body fixed guidance approval for TGSM.

KINETIC ENERGY GUIDED MISSILE

Demonstrate various technologies (integral boost sustained propulsion, low cost structure, beamrider guidance and KE penetrators) required for a cost effective anti-tank weapon system.

KINETIC ENERGY MISSILE

Demonstrate technical feasibility and develop a 5+ KM Kinetic Energy Warhead HAW(G) class missile system. Provide the user with a low cost light weight low volume anti-tank missile system adaptable to a variety of vehicle launch platforms including helicopters.

KINETIC ENERGY PENETRATORS FOR GUIDED MISSILES/HYPERVELOCITY MISSILE PENETRATORS

Design and establish the performance of penetrators which are heavier than the XM829 penetrator.

KINETIC ENERGY PENETRATORS FOR GUIDED MISSILES/OATS-NON AXISYMMETRIC (3D)

Deliver the performance demonstrated by the 2D or Axisymmetric OAT in warhead which can be packaged in a 4-4.5" missile or rocket.

KINETIC ENERGY PENETRATORS FOR GUIDED MISSILES/SPIKE

Validate the extrapolation of the 75MM KE penetrator to the spike weight and L/D.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
MICOM			H-6B
MICOM	AH49		H-6A
ARRADCOM			B-6 C-8
MICOM			H-4
MICOM			C-7 D-11 G-4
MICOM			C-8A D-11 G-10A
ARRADCOM		21.6.1	C-6 D-10 G-8
ARRADCOM		21.6.1	G-9
AERRADCOM		21.6.1	H-6

FIREPOWER

TITLE/DESCRIPTION

LARGE CALIBER AND NUCLEAR ARMAMENTS TECHNOLOGY/FUZE TECHNOLOGY-FZ FOR TANK AMMO

Develop fuzing to maximize effectiveness of heat munitions such as the M456 and XM815/XM830. Increase effective penetration and kill of enemy tanks and air burst fuzing to provide a self-defense capability against sagger sites and helicopters.

LIGHT ARMORED VEHICLE EVALUATOR

Provide low cost night vision systems capability for light armored vehicles in support of the rapid deployment force.

LIGHT WEIGHT LAUNCHER DESIGN (COMPOSITE)

Develop the use of lightweight design techniques as applied to shoulder fired and towed rocket launchers.

LOW COST COMMON MODULE FIRE CONTROL

Provide low cost fire control components and subsystems which will be common to all vehicle weight classes, weapon systems, and operational requirements.

LOW COST IMAGING SEEKER OPTIONS

Assess the hardware potential of various imaging seeker FOV/resolution configurations for FOC-M application.

LOW VOLUME HYPERVELOCITY MISSILE SYSTEM

Demonstrate technical feasibility and develop a 5+ KM kinetic energy warhead HAW(G) class missile system. Provide the user with an improved TOW vehicle successor/complement with combined anti-tank/anti-air capability.

LP TECHNOLOGY

Develop liquid propellant technology to allow decision on development of LP weapon system.

M1 MARK III NIGHT SIGHT

Provide automatic cueing and second generation FLIR in M1 tank for upgrading gunner performance in target acquisition and positioning.

MILLIMETER COMMAND GUIDANCE

Develop countermeasure resistant, high rate of firepower, adverse environment guidance links for hypervelocity anti-armor missiles.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM (HDL)	1L662603AH18-D		A-6 B-9 G-7
ERADCOM	6.37.10A DK70-02		E-4 F-6
MICOM			H-6A
ARRADCOM			G-9
MICOM			C-8A D-11 G-10B
MICOM		2.5.20	C-8 D-12 G-14
ARRADCOM	AH80	19.7.2	G-10 F-6
ERADCOM	6.37.10A DK87-01		B-8 G-5
MICOM			H-6A

FIREPOWER

TITLE/DESCRIPTION

MINI-STARTLE

Demonstrate 95 GHZ radar capability with miniature antenna for fire control prior to engineering full scale development.

MINIMUM SIGNATURE MOTOR FOR ANTI-TANK APPLICATION

Increase kill probability and system performance. Reduce system vulnerability and system signature.

MM WAVE AND LASER COMMAND BEAMRIDER

Develop countermeasure resistant, high rate of firepower, adverse environment direct fire guidance links for common guided anti-tank missiles.

MULTI-ENVIRONMENT ACTIVE RF SEEKER (MARFS) TEST BED

Develop, test, and evaluate a RF seeker capable of tracking both stationary and moving targets in clutter.

MULTI-SENSOR TARGET ACQUISITION SYSTEM (MTAS)

Develop Multi-Sensor target acquisition system for enhanced combat capability. Exploit mm wave radar combined with thermal imaging to provide all visibility surveillance/fire direction.

NEXT GENERATION OF PROPELLANTS

Develop or modify propellant ingredients which expand the burning rate range and reduce afterburning of minimum smoke propellants.

NOISE REDUCTION OF CLOSE COMBAT WEAPONS

Develop the techniques, design approaches and understanding needed to reduce the impulsive noise of rocket motors as it affects man or machine interfaces.

OPERATIONAL AND MAINTENANCE SIMPLIFICATION OF COMBAT VEHICLE FIRE CONTROL

Develop techniques for the simplification and maintenance of combat vehicle fire control systems capable of being incorporated as a standard for future development.

OPTICAL CORRELATOR TARGET CUEING

Demonstrate target cueing and acquisition aided by an optical correlator as applied to missile systems with optical fiber data link.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	6.37.10A DK87-01		A-7 B-7 G-6
MICOM		4.5.14	C-8 D-12 G-7
MICOM			C-7 D-11 G-4
MICOM		4.5.16	A-6 B-9
ERADCOM	6.37.10A DK70-31		B-8A G-10A
MICOM		19.6.3	C-8 D-12 G-9
MICOM			H-6A
ARRADCOM		17.8.3	GA
MICOM			H-6A

FIREPOWER

TITLE/DESCRIPTION

OPTICAL GUIDANCE DATA LINKS

Develop countermeasure resistant, high rate of firepower, reduced exposure time, adverse environment direct fire guidance links for anti-tank missiles, while retaining accuracy, target selectivity, and low cost of present direct fire missiles.

PARTICLE BEAM TECHNOLOGY

Develop and demonstrate the basic technology for achieving a mobile lightweight device capable of operating in the battlefield. Assess associated target effectiveness and military applications.

PLUME/LASER UNGUIDED MISSILE EXPERIMENT

Demonstrate CO₂ laser beam rider guidance link through a minimum smoke hypervelocity rocket exhaust flight plume using existing SPARK missile hardware.

PRECISION AIM TECHNOLOGY

Increase the effectiveness of aircraft armament and fighting vehicles against both air and ground point targets as well as air defense systems against aircraft and missile targets by automatically firing controlled shots from gun tubes undergoing forced vibrations resulting from mount motion.

PROCESSING TECHNOLOGY OF TUNGSTEN ALLOYS

Develop in-house P/M processing techniques to produce 90% tungsten alloys (density = 17 g/cm³) with improved dynamic mechanical properties, and to correlate subscale ballistic performance with these properties.

PRODUCTIZE CO₂ MODULES

Productize critical common module components for carbon dioxide laser rangefinders for combat vehicle use.

PROJECTILE STRUCTURAL INTEGRITY

Develop more cost effective sabots through the use of cast metals, fiber-reinforced aluminum or molded graphite fiber epoxy composites.

PROPULSION-MUNITION INTERFACE TECHNOLOGY/ADVANCED PROPELLANTS/WV ADVANCED ARMOR PROPELLANTS

Demonstrate a muzzle velocity increase of about 4% (200 ft/sec) using a high force nitramine propellant with conventional APFSDS rounds at 60 KPSI.

PROPULSION-MUNITION INTERFACE TECHNOLOGY/CHARGE DESIGN TECHNOLOGY

Demonstrate the feasibility of increased muzzle velocity with a propelling charge of APFSDS rounds.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
MICOM			H-6A
ARRADCOM (BRL)	1L162618AH80	19.7.4	H-5
MICOM			C-7 D-11 G-4
ARRADCOM (BRL)	1L162618AH80	17.7.6	A-8 B-8 C-7 D-11 E-4 F-6 G-5
AMMRC			A-8A B-8A
ERADCOM	6.37.10, DK70-26		H-4
ARRADCOM	1L162618AH80		H-6B
ARRADCOM	AH-18-X X5B		B-6 G-7
ARRADCOM	AH18-X		B-6 G-7

FIREPOWER

TITLE/DESCRIPTION

PROTOTYPE 10.6 MICRON CROSSWIND SENSOR FOR TANKS

Develop a crosswind sensor capable of integration into a tank fire control system to increase the probability of first round hits of the main gun by decreasing the meteorological wind error contribution to the error budget of tank gunners.

QUANTIFICATION OF ROCKET MOTOR SIGNATURE

Validate experimental techniques and develop extended capability to conduct propulsion signature measurements.

QUANTIFY PROPULSION SIGNATURE IMPACT

Validate experimental techniques and develop extended capability to conduct propulsion signature measurements. Develop models to predict propulsion signature interaction with guidance systems using laboratory data as a basic input.

RAM HARDENING OF RANGING ELECTRONICS

Productize critical common module components for carbon dioxide laser rangefinders which will provide eye safe, FLIR compatible performance in smoke, fog, haze, etc.

RAPID SOLIDIFICATION TECHNOLOGY FOR ARMAMENT MATERIALS

Exploit rapid solidification technology as a means of producing high performance armament materials.

RESEARCH IN PHYSICS OF ARMAMENT (COMPOSITE HEAVY METAL PENETRATOR MATERIALS)

Develop tungsten reinforced depleted uranium penetrator material for enhanced launch integrity/terminal performance of K.E. rounds through exploitation of composite technology.

RESEARCH IN PHYSICS OF ARMAMENT (ENHANCED WEAR AND EROSION)

Develop refractory coatings/homogenous materials for enhancement in erosion resistance.

RESEARCH IN PHYSICS OF ARMAMENT (FUNDAMENTALS OF MUZZLE BLAST AND CONTROL)

Develop model to quantitative wave components in muzzle blast and technique for blast reduction.

RESEARCH IN PHYSICS OF ARMAMENT (WEAPON DYNAMICS)

Define physical factors contributing to dynamic response of weapon system and develop mathematical models to formulate the basis for quantitative design methodology.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM (ASL)	AH71/DO		B-6
MICOM			H-6
MICOM			H-6B
ERADCOM	6.37.10, DK70-26		B-8B F-6A G-10B
ARRADCOM	AH84 (FY81) AH19 (FY82)		G-9
ARRADCOM	AH60/B	18.7.2	A-7 B-7 G-6
ARRADCOM	AH60/B		H-4
ARRADCOM	AH60/B		H-4
ARRADCOM	AH60/B		H-6

FIREPOWER

TITLE/DESCRIPTION

RESEARCH OF HIGH DENSITY TUNGSTEN PENETRATOR ALLOYS

Optimize 90-95% tungsten composites of various constituents with respect to processing variables, metallurgical and mechanical properties for best ballistic performance.

ROBOTICS

Design a concept for a mobile robotic launcher system in concert with the Air-Land Battle concept of the new Army.

ROCKET ASSIST KINETIC ENERGY

Develop a KE round which provides high kinetic energy lethality with reduced impulse launch.

SELF FORGING FRAGMENT WARHEAD

Develop a non-axisymmetric explosively forged fragment warhead which will produce a stabilized rod slug.

SHAPE CHARGE TECHNOLOGY

Design and demonstrate a 150MM heat round capable of defeating the FST anywhere within the frontal arc of protection.

SHAPED CHARGES

Improve the performance of shaped charges in fixed calibers.

SMALL CALIBER AUTOMATIC VEHICLE FIRE CONTROL

Develop low-cost, operationally simple, and highly reliable automatic cannon fire control systems allowing enhanced target engagement capability against point targets using a high rate of fire.

SOLID FUEL RAMJET (SFRJ)

Develop and test the 35-40 MM fin and spin stabilized SFRJ. Optimize and finalize the selection of subcaliber SFRJ. Provide DTII testing of SFRJ training munition. Start new AD programs with DARPA transition. Fabricate and test for flight performance of candidate 75MM SFRJ training round. Evaluate and continue tank training round, optimizing nozzle diameter, injector height, effect of fuel additives and fin/spin stabilization. Fabricate and final test full up optimal training round. Start new and AD SFRJ program with DARPA transition.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
AMMRC	1L162105AH84		A-6 B-9 G-7
MICOM		11.10.5	H-6B
ARRADCOM			A-8 B-8 G-5
ARRADCOM	AH18, TA11		G-8
ARRADCOM			G-9
ARRADCOM	AH18, TA11		C-6 D-10 G-8
ARRADCOM		17.8.2	C-8
ARRADCOM	6.2/AH80		A-8A B-8A

FIREPOWER

TITLE/DESCRIPTION

SPECIAL MATERIALS FOR LONG ROD PENETRATORS

Establish the processing method and parameters for the production of special materials for long rod penetrators with the strength required to withstand launching forces as well as armor penetration forces and with the deformation capabilities required in the production process.

STRUCTURAL INVESTIGATION: SABOT/PROJECTILE

Develop more cost effective Sabots through the use of cast metals, fiber-reinforced aluminum or cost graphite fiber/epoxy composites.

STUDY OF TANK GUN JUMP PHENOMENA

Quantify the occasion variation in jump within a given tank system. Quantify the differences in mean jump exhibited by different tanks. Use the jump data base to identify possible fire control and/or alignment procedures for improving tank system delivery accuracy.

SUBMILLIMETER DEVICES (6.1 RESEARCH IN MSL AND HEL)

Demonstrate practical near-millimeter wave integrated circuits (as opposed to current oversized quasi-optics) for missile systems.

SUBMILLIMETER WAVE (6.1 RESEARCH IN MSL AND HEL)

Evaluate the potential for using the spectral region around one millimeter to detect, identify, and direct fire onto hostile targets obscured by fog, smokes, and other battlefield obscurants.

SYNTHESIS OF HIGH-ENERGY EXPLOSIVES/SUPERENERGETIC EXPLOSIVE FORMULATIONS

Provide 50% enhancement in shaped-charge and SFF penetration of armor by use of superenergetic explosives.

TANK SMART MUNITIONS

Improve the direct fire accuracy of munition and insure high kill probability. Permit effective engagement of threat targets at extended ranges and complements conventional munitions.

TECHNICAL VULNERABILITY REDUCTION

Reduce vulnerability of visible sighting systems to laser radiation.

TGW CORRELATOR (6.1 RESEARCH IN MSL AND HEL)

Develop a fit and function demonstration of the optical correlator by building a photonic computer which accomplishes top view correlation of a 4 inch diameter space.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
AMMRC	1L263102D071		A-8A B-8B
ARRADCOM		18.7.1	H-5
AMSAA			H-5
MICOM			H-5
MICOM		5.5.10	H-6
ARRADCOM	AH 60/AM AH 18/UC		A-7 B-7 G-6
ARRADCOM	6.2/AH18		A-8A B-8A G-10A
ARRADCOM			H-4
MICOM			C-6 D-10 G-8

FIREPOWER

TITLE/DESCRIPTION

THERMOMECHANICAL TREATMENT FOR IMPROVED PERFORMANCE OF DU-3/4 Ti KE PENETRATOR ALLOYS

Develop thermomechanical treatments which will refine grain size, retain texture, and further reduce residual stresses of the DU 3/4 Ti alloy. Improved ballistic performance, and process simplification with concomitant cost reduction are the ultimate goals of the program.

VEHICLE DYNAMIC SENSORS

Provide low cost sensors which will provide information on own-vehicle dynamics to the fire control processor. Where appropriate, compensation will involve sensor definition, placement, and development of compensation techniques.

VERTICAL LAUNCH CONCEPTS DYNAMICS

Prepare concepts of FOG-M in or on various launch vehicles. Simulate launcher and rocket motion of vertical launched missile to determine launch errors. Investigate various eject concepts for launching missiles.

VERY LONG KINETIC ENERGY PENETRATORS

Demonstrate high penetrator lethality at greatly reduced weight. The use of current penetrator technology causes severe weight and volume problems for future kinetic energy missiles.

VHSIC FIRE AND FORGET SEEKER

Develop advanced scanning (8-10 micron) infrared seeker technology for fire and forget applications. Demonstrate advanced detector assemblies using focal plane array technology to improve seeker performance and reduce unit costs.

WARHEAD/FUZE TECHNOLOGY SYNTHESIS

Insure that warhead and fuze concepts and developments for Army missile systems reflect the total technology advancements and products of all DoD investments. This will be accomplished by demonstrating integrated prototype warheads and fuzes in dynamic testing which support future Army Missile Laboratory weapon concepts.

WEAPON STATION CONTROLLER

Develop an analysis, design and test methodology, employing modern control theory design and synthesis techniques to assess, design, and develop optimal controllers to improve the dynamic performance of the combat vehicle weapon system interaction dynamics.

FIREPOWER

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
AMMRC	1L62105AH24		A-8 B-8 G-5
ARRADCOM	AH19	17.8.4	E-4 F-6A G-10B
MICOM			H-6B
MICOM			C-8A D-12 G-10B
MICOM		2.5.12	C-7 D-11 G-4
MICOM			C-8A D-12 G-10B
TACOM			H-5

FIREPOWER

TITLE/DESCRIPTION

WEAPON STATION INTEGRATION

Develop advanced weapon station components, sub-systems, and techniques into demonstrable state-of-the-art weapon systems for turret/weapon integration.

WEAPON SYSTEM ACCURACY

Gain the technology to predict and ultimately improve the accuracy of gun/projectile systems. Near term objective for tanks: investigate sources of "jump" in tank guns and pursue methods of mitigation.

FIREPOWER

COMMAND

PROJECT NO.

DARCOM PLAN PARA NO.

ACV S&T PLAN PG NO.

TACOM

1L162601AH91

2.7.2

B-6

ARRADCOM

1L16218AH80

H-6B

MOBILITY

TITLE/DESCRIPTION

20-40 TON TRACK

Design and develop a new track and sprocket for vehicles in the 20-40 ton weight range. Six thousand mile track life compared to present 3,000 miles. Reduce cost/mile by 30%. Reduce RAM-D characteristics by 30%.

45-65 TON TRACK

Development of a highly functional and economical common track for 45-65 ton weight class combat vehicles featuring quick disconnect replaceable chevron pads, improved tractive efficiency, and designed to accommodate both forged, cast, and fabricated manufacture. Expected benefits include goals of: basic track life equal to vehicle rebuild cycle; 75% increased pad life; interoperability on M-1, M48/M60 and M88; broadened production base; and reduced overall maintenance burden.

ADIABATIC ENGINE PROGRAM

Develop an advanced high output diesel engine making use of high temperature materials to insulate combustion system components allowing operation at high temperatures without the use of a conventional cooling system. The engine will use a power recovery turbine to capture the greatly increased exhaust gas energy and will be highly fuel efficient, compact, light weight, and low cost per HP.

ADVANCED ADIABATIC TECHNOLOGY

The overall objective of this work is to develop novel and advanced technology for application within "adiabatic", high-temperature type engine applications. The concept of engine friction minimization through concepts such as ringless pistons and ceramic, unlubricated bearings is integral to the program. The work further emphasizes: high-temperature lubrication and wear (including solid lubricants), high temperature advanced material design and development, and advanced component design and development. Success of the program will allow both improved fuel economy and elimination of the engine oil system.

ADVANCED AIR FILTRATION

Develop more efficient combat vehicle engine air cleaning systems which significantly extend the vehicle maintenance interval. Develop a dust detector and indicator which alerts the operator of an air filter malfunction. Integrate the NBC protection functions into the engine air filtration system.

ADVANCED COMPOSITE MATERIALS

To develop critical components of reduced volume and/or weight for advanced design utilizing metallic and non-metallic composites.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM	1L263631D424	2.4.12	G-15
TACOM	1L263631D424	2.4.14	A-11 B-12 G-13
TACOM	1L263621DG07	2.4.26 23.4.1	F-9 G-13
TACOM	1L162601AH91	2.4.26 23.4.1	F-9 G-13
TACOM	1L162601AH91	2.4.5	A-9 B-10 C-9 D-13 E-5 F-7 G-11
TACOM	1L162601AH91	2.4.20 2.4.21 8.16.3	A-10 B-11 C-10 D-14 E-6 F-8 C-12

MOBILITY

TITLE/DESCRIPTION

ADVANCED DIESEL - 1000 HP

Upgrade the Cummins VTA 903 (Military Rating 500 HP) engine to 1000 HP utilizing advances in the state-of-the-art which will help to provide a high power density engine while maintaining the original structural design limitations of the engine. The engine design utilizes fixed low compression ratio, high efficiency high boost turbocharging and turbocompounding.

ADVANCED INTEGRATED PROPULSION SYSTEM COMPETITIVE DESIGN

Design a complete power package assembly to include engine, transmission, cooling system, air filtration, auxiliary power generation, signature limitation, diagnostic and maintainability concepts. This package will be housed in a 33% smaller compartment and given greatly increased fuel tolerance and efficiency.

ADVANCED TACTICAL POWER SOURCES

To develop high rate, high energy density (2-4 times present lead-acid batteries), cost effective rechargeable batteries to overcome operational deficiencies and cycle life problems of present batteries for M1, other combat vehicles down to low temperatures.

ADVANCED TRACK AND SUSPENSION MATERIALS/STRUCTURES

Reduced life-cycle-cost through increased life, improved RAM-D and mobility, and reduced component weight.

ADVANCED TURBINE ENGINE/CERAMIC RECUPERATORS

Development of Ceramic Recuperator for gas turbine engine. Capability to operate at higher temperature than currently utilized metals will improve overall engine efficiency.

ANALYTICAL BASE DEVELOPMENT

Development of in-house capability for dynamic computer-aided track component and system design and analysis.

ANALYTICAL BASE HARDWARE

Installation and activation of in-house computer system dedicated to track component and system design and analysis.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM	1L263621DG07	2.4.40	F-9 G-13
TACOM	1L263621DG07	2.4.1	G-14
ERADCOM	1L152705AH94 1L263702DG10		A-11 B-12 C-11 D-15 E-7 F-9 G-13
TACOM	1L263631D424	2.4.36	A-11 B-12 C-11 D-15 E-7 F-9 G-13
TACOM		2.4.2 23.4.3	B-12 G-14
TACOM	1L162601AH91	2.4.41	H-8
TACOM	1L263631D424		H-8

MOBILITY

TITLE/DESCRIPTION

AUXILIARY POWER UNIT, 15 KILOWATT

To upgrade the 10 KW Auxiliary Power Unit to provide 15 KW electrical power for low temperature starting of the vehicle main engine unaided by batteries and to supply critical electric loads for stand-by/silent watch operation requiring low external audibility.

CANE TIP MINE NEUTRALIZING SYSTEM

Develop the capability to disperse and detonate solid high explosives for breaching minefields.

CERAMICS WITH IMPROVED TOUGHNESS FOR VEHICULAR ENGINES

To develop ceramic materials with increased fracture toughness for structural application in vehicular engines.

COMBAT AND TACTICAL SYSTEMS DYNAMICS

Future efforts will entail extending the theory to: Do design sensitivity and optimization studies. Include the flexibility of elements and structural compliance. Couple the rigid body and servo system controller dynamics. Account for intermittent motion. Include the study of "robotics" in order to perform functions in a hazardous environment. Plans also include actual hardware in the loop testing to verify the theoretical methodology.

COMBAT MOBILITY FUELS

Develop capability to permit implementation of fuel prepositioning and rapid field assessments of fuel in storage, depot, or vehicle environments. As part of this thrust, a fuel stabilizer additive is being developed to reduce fuel degradation tendencies.

COMBAT VEHICLE PROPULSION/1000 HP TRANSMISSION

The development of a 1000 HP transmission for tracked combat vehicles in the 35 to 45 ton weight class. The objectives of the program are to reduce weight and volume of transmission thus enhancing survivability by virtue of lower vehicle silhouettes. A modular approach for ease of maintenance will be pursued.

COMPLIANT SUSPENSION SYSTEM

To develop and evaluate a suspension system which automatically changes springing and damping to provide optimum performance over different terrains. This capability would result in improved vibration isolation with accompanying gains in ride quality and gun platform stability over a range of terrains.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM		2.4.44	B-12
MERADCOM	1M263606D608-05	6.5.3	H-8
AMMRC	AH84		H-7
TACOM	1L162601AH91	2.4.43	H-7
MERADCOM	6.11.02.A, 6.27.33.A	8.17.2	A-9 B-10 C-9 D-13 E-5 F-7 G-11
TACOM	1L263621D395		G-15
TACOM	1L162601AH91 and 1L263631D424	2.4.32	G-15

MOBILITY

TITLE/DESCRIPTION

CORROSION PREVENTATIVES

Develop new and improved corrosion preventatives for Army and DoD use which respond to unique military requirements and needs. Within this project, a long-life coolant system is to be developed to eliminate maintenance and drain requirements. Also, there is an effort to improve the performance of the current GAA military grease.

CVX-650 HYDROMECHANICAL TRANSMISSION

To develop a hydromechanical steering transmission for tracked vehicles up to 25 tons.

DEVELOPMENT OF NOISE REDUCTION TECHNIQUES FOR LIGHT ARMORED TRACK VEHICLES

Development of technology to reduce track-generated noise.

DRIVERS THERMAL VIEWER

Provide thermal driving capability for combat vehicles which will permit driving in fog, smoke, dust, and other dirty battlefield conditions.

DUAL CHANNEL (BACK UP) CONTROL FOR GAS TURBINE ENGINES, FLUIDIC TECHNOLOGY

Develop a dissimilar fuel control system utilizing fluidics so that start, re-start, and nearly full control is maintained in the event of an electronic control failure.

ELECTRIC HYBRID DRIVE

Analysis and development of hybrid electric systems, i.e., systems employing an engine combined with electric drives. Determination of applicability to tactical and combat vehicles to satisfy high speed and power density requirements along with signal-less operation.

FLUIDIC DAMPER

To develop a fluidically controlled damper capable of sensing terrain induced vibration and adjusting damping according to terrain induced vibration demand.

FLUIDIC HEADING REFERENCE

Develop a fluidic/electronic heading reference unit for armored vehicles.

FRACTURE MECHANICS & STATIC FATIGUE BEHAVIOR OF HEAT ENGINE CERAMICS

Structural ceramics have shown promise for usage in heat engines and this has prompted the current surge of mechanical property research. Among the properties that must be evaluated are the fracture toughness, creep resistance and also the resistance to static fatigue. The temperature dependence of these properties must be determined as well as the effect of prolonged exposure.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
MERADCOM	6.11.02.A, 6.27.33.A, 6.31.04.D	8.17.5	A-9 B-10 C-9 D-13 E-5 F-7 G-11
TACOM	1L2636211395	2.4.4	C-11 F-9
TACOM	1L162601AH91	22.11.2	D-15
ERADCOM	6.37.10A DK87-04	15.9.1	G-14
ERADCOM (HDL)	1L162120AH25/03		
TACOM	1L263621D395		
TACOM	1L263631D424	2.4.18	A-10 B-11 C-10 D-14 E-6 F-8 G-12
ERADCOM (HDL)	1L152120AH25/03		A-10 B-11 C-10 D-14 E-6 F-8 G-12
AMMRC	AH84		H-7

MOBILITY

TITLE/DESCRIPTION

FULL SCALE SIMULATION

To provide a systematic approach to predict and evaluate the combat vehicle system battlefield performance and effectiveness. The process includes the analytical simulation of the vehicle system to assess mobility, agility, firing platform stability, gun pointing accuracy, ride quality and speed. The analytical outputs shall be validated per laboratory experimental simulation and field test evaluation.

FUNCTIONAL FLUIDS

Develop new and improved functional and power transmission fluids for use in present and future Army combat and tactical equipment. The major thrust is to develop a common fluid that will function as an engine oil and transmission fluid in the M1 tank.

HIGH MOBILITY ENERGY EFFICIENT SYSTEM

Provide the most energy efficient combination of track, drive, and suspension components with regard to the configuration, weight, function, RAM-D, and life-cycle-cost.

HIGH STRENGTH MATERIALS AND COMPONENTS

To develop a criteria for designing and fabricating large-size components from high strength materials.

HORIZONTAL POSITION AND ATTITUDE SUBSYSTEM

To define the technical parameters and to fabricate and test a brassboard inertial-based system that will provide in real time, the host vehicle's position and pitch and roll attitude.

IMPROVED DRIVER'S HATCH

To design and develop a driver's station which provides buttoned-up practically the same vision/driving performance as with the head outside and maintains the driver's used relationship to the controls, vehicular feel and vehicle behavior judgement. It permits NBC closed hatch operation.

INDEPENDENT EXTERNAL SUSPENSION

Design and develop improved suspension systems with modular units at each wheel station which contain complete springing and damping functions within a compact envelope, mounted exterior to the hull. This approach will eliminate torsion bars and the vulnerable, strut type dampers from tracked vehicle suspensions.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM		2.4.42	H-7
MERADCOM	6.27.33A 6.31.04D	8.17.4	B-12 G-14
TACOM	1L162601AH91 1L263631D424	2.4.34	A-10 B-11 C-10 D-14 E-6 F-8 G-12
TACOM	1L162601AH91	2.4.19	H-7
MERADCOM	4A762707A855A		A-10 B-11 C-10 D-14 E-6 F-8 G-12
TACOM		2.4.45	C-11
TACOM	1L263631D424	2.4.30	G-15

MOBILITY

TITLE/DESCRIPTION

LIGHTWEIGHT LAUNCHER DESIGN

Assess state of technology for use of metal Matrix composites and protruded shapes in launcher structures. Reduce the weight of an artillery type launcher to 40% of rockets weight.

LOW COST LAND NAVIGATION

To improve the positioning and heading capability of combat vehicles, mobile artillery and mobile missile launcher system with a moderate cost land navigator having an accuracy of .5-1% distance traveled and heading of less than 1°.

LUBRICANTS FOR CONVENTIONAL/NON-CONVENTIONAL ENGINES

Develop lubricants which improve performance and maintenance concepts for existing engine systems within the tactical fleet and to also develop suitable lubricant for future non-conventional engine systems (i.e., the adiabatic diesel engine).

M1 ABRAMS/M60 TRACK IMPROVEMENT

To reduce life-cycle-cost and reduce maintenance for the M1 Abrams and M60 vehicles.

M1 INTEGRATED COUNTERMINE SYSTEM

Initiate total system countermining capability and perform system and engineering analysis for the M1 tank.

MATERIALS CHARACTERIZATION (ADVANCED MATERIALS APPLICATIONS)

Measure physical/mechanical/thermal properties of new or improved materials being considered for missile/rocket system applications. This includes conduct of tests on new materials, improved alloys, metal matrix composites, etc. to establish range of property data not available from other sources.

MULTI-PURPOSE DETECTION SYSTEM

Development and demonstration of new concepts for detecting mines and explosives in urban terrain where other approaches fail due to interference and obscuration.

NATO/FOREIGN TRACK ANALYSIS

To achieve commonality of track for NATO Combat Vehicles, and to assimilate foreign track technology into present and future US track systems.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
MICOM			H-8
MICOM			A-10 B-11 C-10 D-14 E-6 F-8 G-12
MERADCOM	6.11.02A, 6.27.33.A 6.31.04.D	8.17.3	A-9 B-10 C-9 D-13 E-5 F-7 G-11
TACOM	1L263621D424	2.4.37	A-11 B-12 C-11 D-15 G-13
MERADCOM	1M263606D608-16	6.5.5	H-7
MICOM			H-8
MERADCOM	AH51RE, AH20BM	6.6.4	H-7
TACOM	1L162601AH91	2.4.15	A-11 B-12 C-11 D-15 E-7 F-9 G-13

MOBILITY

TITLE/DESCRIPTION

NBC RESISTANT TRACK AND SUSPENSION

Provide non-metallic track and suspension components which are unaffected in NBC and decontamination environments.

NO MAINTENANCE BEARING/SEAL AND ROADWHEEL HUB

To develop and evaluate a self-lubricating bearing/long lasting seal combination which provides maintenance free operation between vehicle overhauls.

OFF-ROAD MOBILITY

Improve vehicle design and performance evaluation methodology in the area of running gear performance, agility and steering, obstacle crossing and off-road drivability.

OXYNITRIDE GLASS-CERAMIC/FIBER COMPOSITES FOR ENGINES

Recent advances in high temperature glass research and in techniques for production of ceramic fibers have created opportunities for development of readily formable, fiber-reinforced glass-ceramics with good high temperature strength and fracture toughness. The objective of this program is to develop and evaluate such composites for use in heat engines.

SCATTERMINE DETECTION

Demonstrate the feasibility of detecting air delivered minefields by modification of a sensor system developed for other purposes.

SELF CLEANING AIR FILTER (SCAF)

To provide combat vehicle Self-Cleaning Air Filtration Systems which increase the service interval by a factor of 10. Self-Cleaning Air Filtration Systems will encompass both diesel and gas turbine powered combat vehicles.

STRUCTURES ANALYSIS/MODELLING TECHNIQUES

Develop efficient techniques for modelling of both metal and composite structures. Reduce storage requirements and provide for more efficient use of computing facilities for SAP 6/7. Develop finite difference programs for analysis of rotationally symmetric shells under discontinuous loadings by both successive time step integration method and MODAL superposition method.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM	1L263631D424	2.4.33	A-10 B-11 C-10 D-14 E-6 F-8 G-12
TACOM	1L162601AH91 and 1L263631D424	2.4.38	G-15
TACOM	1L162601AH91		H-7
AMMRC	AH84		H-7
MERADCOM			H-7
TACOM	1L162601AH91	2.4.6	A-9 B-10 C-9 D-13 E-5 F-7 G-11
MICOM			H-8

MOBILITY

TITLE/DESCRIPTION

SYNTHETIC AND ALTERNATE FUELS

Develop a capability that will allow the Army to utilize mobility fuels derived from non-conventional crude sources without affecting mission requirements. Program involves laboratory, engine and systems testing, and fleet tests of candidate products refined from shale and coal conversion processes to assure their suitability in Army equipment. Status: Test programs in progress have been evaluating JP-5 & DFM fuels refined from shale oil syncrude. The fuels performed satisfactorily in the tests conducted thus far. Additional shale derived fuels from a different shale extraction process are due for testing during FY82.

TANK-AUTOMOTIVE TECHNOLOGY/ADVANCED TURBINE (CERAMIC COATINGS)

Investigate turbine engine component ceramic heat barrier coatings as a means of increasing cycle temperatures with resultant efficiency increases. A minimum turbine inlet temperature (TIT) of 25000 F., with 7% maximum cooling air (nozzle/rotor) are project goals.

TANK-AUTOMOTIVE TECHNOLOGY/ENGINE CONCEPTS FOR ALTERNATE FUELS

Establish a technology base for development of efficient alternative fuels combustion systems for incorporation in engines for military ground vehicles starting in FY85, through investigation and generation of new technology in the key areas of: (1) Microprocessor Controlled Fuel Injection, (2) Ancillary Componentry Modulation, (3) Sensors, (4) New Alternative Fuel Combustion Processes and (5) the combination of 1 through 4 into new combustion system concepts.

TRACK RETENTION AND CONTROL

Maintain positive track engagement to minimize skipping, misguiding, or loss under all types of operating conditions.

TRACK RUBBER DEVELOPMENT

Increased track pad life with a resultant lower life cycle cost.

TRANSMISSION COMPONENT DEVELOPMENT

To effect reduction in size and weight and to increase the efficiency and performance of current and future transmissions. New and novel materials, examination of the exact duty cycles. Rerating/redesigning components, application of electronic controls, improvements in hydrostatic unit efficiencies, etc. will result in attaining goals.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
MERADCOM	6.11.02A, 6.27.33A 6.31.04.0	8.17.1	A-9 B-10 C-9 D-13 E-5 F-7 G-11
TACOM	1L162601AH91	2.4.2 23.4.3	B-12 G-14
TACOM	1L162601AH91	2.4.27	A-9 B-10 C-9 D-13 E-5 F-7 G-11
TACOM	1L162601AH91 1L263631D424	2.4.23	A-11 B-12 C-11 D-15 E-7 F-9 G-13
TACOM	1L162601AH91 1L263631D424	2.4.35	A-10 B-11 C-10 D-13 E-6 F-8 G-12
TACOM	1L263621D395	2.4.3	A-9 B-10 C-9 D-13 E-5 F-7 G-11

MOBILITY

TITLE/DESCRIPTION

VEHICLE ENGINE DEVELOPMENT/ENGINE CONCEPTS FOR ALTERNATE FUELS

Drawing from the technology base established by the 6.2 task, engine concepts for alternative fuels, develop alternative fuels combustion systems for incorporation in existing engines (as modification kits), current development engines and future engines.

WIDE AREA NEUTRALIZATION DEVICE (WAND)

Provide acoustic, seismic, magnetic, etc., signatures of combat vehicles that will defeat remote mines equipped with sophisticated sensors.

WINTERIZATION TECHNOLOGY

Develop a systems approach to the development of standardized winterization equipment for all Army ground vehicles, including self-sustaining multifuel burning fuel fired heaters.

MOBILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM	1L1663621DG07	2.4.27	A-9 B-10 C-9 D-13 E-5 F-7 G-11
MERADCOM	AH20-B 1	6.5.1	H-8
TACOM	1L162601AH91		H-8

SENSING

TITLE/DESCRIPTION

2ND GENERATION CROSSWIND SENSOR

Develop real-time remote wind sensor based on optical techniques that will reduce wind contribution to the error budget of direct fire weapons.

3-5 MICRON FOCAL PLANE ARRAY, LIQUID PHASE EPITAXY

Further develop designs and components for standard 3-5 micrometer thermoelectric cooled detector arrays using liquid phase epitaxy (LPE) growth methods to optimize yield and uniformity.

3rd LASER RADAR TECHNOLOGY DEMONSTRATOR

Develop an advanced laser radar sensor head capable of automatic real-time target classification at ranges to 3 kilometers using 3D target classification techniques when coupled with an appropriate processor.

8-14 MICRON IRDA

8-14 Micron FPA sensor will be integrated for demonstration with existing data processing.

ACOUSTIC SENSORS

To provide the potential for detection, track, and classification of threat vehicles based on the acoustic characteristics generated by the threat vehicle.

ACQUISITION SUBSYSTEM (HEL)

Development of advanced target acquisition, tracking, and fire control techniques for land and air targets.

ACV-L REMOTE SENSOR PACKAGE

Develop remote sensor package to maintain commander's overwatch and gunner's target serving capability on armored combat vehicles employing an elevated gun and one-man turret.

ADDEV OF AUTOMATIC LIQUID AGENT DETECTOR, XM85, XM86

Provides automatic warning of on-target liquid chemical agent rain attacks through a detection mechanism which utilized electrical changes on detector grids from the physical chemical reaction of the agent on the grid.

ADVANCED COMMANDER'S VEHICLE SIGHT

Provide automatic cueing and second generation FLIR in M1 tank for upgrading the commander's performance in target acquisition and positioning.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	62709DK95A0	11.5.2	B-17 G-19
ERADCOM	DK7002	11.5.3	C-15
ERADCOM	DN95-N0		C-16 F-13 G-20
MICOM	RNT-15	4.5.5	A-14 B-15 C-14 D-17 E-10 F-11 G-17
ARRADCOM	1L162617AH1902	5.8.21	A-13 B-13 C-13 D-16 E-8 F-10 G-16
MICOM	RH-7	16.7.3	A-14 B-15 C-14 D-17 E-10 F-11 G-17
ERADCOM	63710ADK8701		G-18
ARRADCOM	1W763721D60105		A-13 B-13 C-13 D-16 E-8 F-10 G-16
ERADCOM	63710ADK8701	11.11.5	B-16

SENSING

TITLE/DESCRIPTION

ADVANCED GROUND TO GROUND TARGET ACQUISITION RADAR

Develop advanced signal processing techniques 94 GHZ Radar to allow for target classification and identification.

ADVANCED GUNNER'S SIGHT (ACV-II)

Provide automatic cueing and second generation FLIR in M1 Tank for upgrading gunner performance in target acquisitions and positioning.

ADVANCED MILITARY COMPUTER FAMILY (MCF) PERIPHERALS

Develop smart peripherals much improved over present devices, utilizing MCF hardware and used with MCF.

ADVANCED MULTI-SENSOR GUNNER'S SIGHT

Develop Multi-Sensor target acquisition system for an enhanced anti-armor capability. The technical approach is to exploit mm wave radar combined with an advanced FLIR sensor for long range target acquisition and anti-armor missile guidance through degraded weather.

ADVANCED RADAR TECHNOLOGY

Develop MMW transceiver with programmable signal processor for low probability of intercept (LPIR) and dual frequency radar for improved low angle track. Applications are to gun fire control.

AIRBORNE MINEFIELD DETECTION SYSTEM

Develop an alternate mission payload subsystem for the Army RPV, optimized for high resolution low altitude detection of minefields. Develop a forward deployed ground station to provide hand-off control of the RPV and support the real time processing of transmitted data to facilitate early detection of minefields.

ALL VISIBILITY TARGET ACQUISITION

Develop MMW Radar Technology to complement thermal imaging systems to provide all weather target acquisition for both moving and stationary targets.

ANALYTICAL TECHNIQUES FOR THE DESIGN AND APPLICATION OF SENSORS

Investigate the seismic, acoustic, and electromagnetic signatures of military and intruder-type targets and the theoretical aspects of signature propagation to support the development of environmentally insensitive sensor configurations for detecting, classifying, and/or locating such targets.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	DH95-D0	14.8.5	A-12 B-14 C-12 D-18 E-9 F-12 G-18
ERADCOM	DK87-01		B-19 G-20
CECOM	1X463723D186.02		H-9
ERADCOM	DK87-03		B-19 G-20
ARRADCOM			G-19
MERADCOM	AH20BM	6.6.1	C-15
ERADCOM	63710ADK7013	11.11.7	B-17 C-19
USAEWES	4A7620AT42/BE3/001		H-10A

SENSING

TITLE/DESCRIPTION

ARMORED COMBAT VEHICLE HEAVY - NIGHT VISION SYSTEM

Develop advanced all-visibility night vision for crew of the main battle tank based on technology advancements in FLIR components, millimeter radar, multi-functional lasers and auto processing.

AUTO TRACKER

Design and development of an automatic tracker for combat vehicles and determine effect on first round hit probability and fire-on-the-move capability.

AUTOMATED SYSTEMS PERFORMANCE MODELS

Generate E-O sensor, MMW radar, and smart sensor models for future design optimization and conclusion in battlefield simulations and analysis. Develop MMW computer analysis model.

AUTOMATED SYSTEMS UNDERSTANDING

To obtain mathematical models capable of making systems and component design decisions. Testing techniques can be developed from analytic modeling concepts.

AUTOMATIC TARGET ACQUISITION

To provide automatic target detection and classification from FLIR and TV sensors, by image processing techniques.

AUTOMATIC TARGET RECOGNIZER DIGITAL IMAGERY DATA BASE

Develop target and background signature image processing techniques for smart sensors and automated weapons systems and weapons effectiveness studies. Measure and characterize significant features of targets in EO/IR/MMW spectral bands for smart sensor seeker performance assessment and target acquisition modeling. Maintain data base for resulting signatures.

AUTONOMOUS ACQUISITION ALGORITHMS AND PROCESSOR (RE-9)

Development of an automatic acquisition capability for self-contained munitions through the development of algorithms and processors for use with imaging sensors.

BATTLEFIELD ENVIRONMENT WEAPON SYSTEM SIMULATION (BELDWSS/BFWSS) (RG-1)

Perform simulations of weapon system and battlefield environment.

BENCH EVALUATION

To establish laboratory sensor evaluation techniques that will provide repeatable measures for evaluating different sensors that relate to the real world performance of these sensors.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	63710ADK8701		B-17 G-19
ARRADCOM	AH19-F		B-16
ERADCOM	1L162709DH951/S0		H-10
ERADCOM	1L161102A31B		H-9
ARRADCOM	1F262201DA96		A-12 B-14 C-12 D-18 E-9 F-12 G-18
ERADCOM	1L162709DH95/S0		H-9
MICOM	RE-9	2,5,12	H-10
MICOM	RG-1		H-10
ERADCOM	1E263710DK70-05		H-10

SENSING

TITLE/DESCRIPTION

CHEMICAL ALARM TECHNOLOGY

Feasibility evaluation and development of a prototype sampling system which has the capability to monitor ambient air both outside and inside vehicles and provide an early warning to the crew of a chemical hazard.

CO₂ LASER RANGEFINDER

Develop CO₂ Laser Rangefinder integrated into M1 tank. Rangefinder will have a ranging capability complementary with thermal imager performance even under moderately adverse atmospheric conditions.

COMMON MODULE MULTI-FUNCTION LASER

Develop highly reliable laser components for use in advanced multi-functional CO₂ laser device. This device will provide rangefinding, range rate sensing and remote crosswind velocity sensing.

CONCEPTS OF MINEFIELD BACKGROUND DATA PROCESSING, FILTERING, AND AUTOMATIC SCANNING

Develop, demonstrate, and synthesize new data analysis concepts for evaluating frequency dependent electromagnetic response from mine/minefields and terrain backgrounds. The evaluation will be accomplished using existing and evolving data bases and will be directed toward identifying methods of consistently and efficiently separating mine/minefields from the background. The results will be directly applicable to the reduction of terrain effects on the development of automatic process for mine detection equipment.

CORRECTED TRAJECTORY PROJECTILE

Development of a system to track target and projectile in flight, predict miss, calculate and transmit correction to projectile which then executes the correction for the purpose of increasing first hit probability.

DAMAGE ASSESSMENT CONCEPTS

Utilizing existing or near term sensor technology which will be available in combat vehicles, formulate concepts for an assessment of damage resulting from a hit on target to determine whether additional round expenditure is required.

DIGITAL TURRET DEMONSTRATION

To demonstrate feasibility of a high performance digital weapon pointing and tracking system capable of engaging multiple maneuvering targets and compensating for error sources associated with barrel flexure, nonlinearities, base motion and recoil disturbances.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM	1L162706A5533I		A-13 B-13 C-13 D-16 E-8 F-10 G-16
ERADCOM	63710AT K8706	9.9.22 11.7.2	B-16
ERADCOM	63710DK8701	11.11.8	B-17 C-15 F-12 G-19
USAEWES	4A161102AT22/CO/003		H-10A
ARRADCOM	AH19-F	17.8.6	B-16
ARRADCOM	AH19		A-14 B-15 C-14 D-17 E-10 F-11 G-17
ARRADCOM			B-16 G-18

SENSING

TITLE/DESCRIPTION

DRIVER'S THERMAL VIEWER

Provide thermal driving capability for combat vehicles which will permit driving in fog, smoke, dust, and other dirty battlefield conditions.

DROPABLE CRT

Develop ruggedized CRT.

DYNAMIC MUZZLE SENSING

Provide a means of detecting and compensating for motion of the gun muzzle in a dynamic environment to tube flexure thereby coupling the gun muzzle to the LOS for optimal fire initiation.

DYNAMIC SIGNATURES OF TARGET SURROUND FEATURES IN REALISTIC WORLD ENVIRONMENTS

Develop more realistic mathematical relations that simulate dynamic thermal signatures for natural features. These signatures are needed to provide a rational and realistic design data base for advanced surveillance and terminal homing equipment. Emphasis is on deterministic, multi-dimensional modeling capabilities that are valid for the spectrum of terrain/weather and surface materials experienced worldwide.

EFFECTIVENESS ASSESSMENT

Countermeasures to electro-optical imagers are a potential near term threat. Conceptual measures to counter this threat have been generated. To determine the battlefield value of these measures, an assessment must be made of their effectiveness. This assessment is the prime objective of this task.

ELECTROMAGNETIC TARGET SURROUND CHARACTERISTICS IN NATURAL TERRAINS

Provide designers, developers, and evaluators of target acquisition and surveillance systems that exploit visible (V), infrared (IR), microwave (MW), and millimeter wave (MMW) electromagnetic energy with a coherent body of information that permits systematic and quantitative consideration of ambient background (surround) conditions and responses of worldwide environments to these energy types.

ELEVATED TARGET ACQUISITION SENSOR SYSTEM (ETAS)

Develop mobile elevated day/night surveillance and target acquisition/positioning system for artillery battalion observation post.

EVALUATION OF FALSE ALARM MECHANISMS AND SOURCES FOR MINE/MINEFIELD LOCATION

Improve mine/terrain background classification algorithms through better accommodation of false alarm sources and mechanisms. The classification algorithms employed will be those found most effective for background suppression and algorithms selected by the developer as candidates for implementation in standoff mine detection systems.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM	63710ADK8704	15.9.1	A-14 B-15 C-14 D-17 E-10 F-11 G-17
CECOM			H-10A
ARRADCOM	AH19		A-14 B-15 C-14 D-17 E-10 F-11 G-17
USAEWES	4A161102AT22/C0/005		H-10A
ERADCOM	1E263710DK7C-05		H-9
USAEWES	4A762730AT42/BE3/002		H-10A
ERADCOM	63710ADK8701	11.11.6	D-16
USAEWES	4A762712AT40/B0/049		H-10A

SENSING

TITLE/DESCRIPTION

FIBER OPTIC TRANSMISSION SYSTEM (LOCAL DISTRIBUTION)

Replacement of CX-4566 (26 pair) cable with an optical cable system.

FIBER OPTIC TRANSMISSION SYSTEM (LONG HAUL)

The FOTS(LH) will be compatible and interoperable work with existing tactical digital communications equipment interconnected by CX-11230 twin metallic coaxial cable. This includes ATACS equipment, improved ATACS equipment and selected TRI-TAC equipment. FOTS(LH) will be capable of operating over optical cable path lengths of from 300 meters to 6 kilometers without repeaters and up to 64 kilometers using no more than 10 repeaters.

FLAT PANEL EL DISPLAYS

To develop reliable, rugged, lightweight, compact, solid state displays, capable of displaying full video graphics legibly in light levels from total darkness to direct sunlight. Design goals include standard module configuration, built-in operator interactive touch panel and compatibility with Military Computer Family (MCF).

IMPROVED NON-STANDARD CONDITION SENSOR

To develop, fabricate, and evaluate sensors for the measurement of non-standard conditions associated with engagement as air temperature, air density, grain temperature, and tube wear. This sensor will eliminate the need for manual input of such data into the fire control ballistics solution.

INTEGRATED PROCESSING SYSTEM

Provide computational capacity required for auto track, maneuvering target prediction, auto-cue, digital control and stabilization, ballistics within volume constraints of combat vehicle.

INTEGRATED SENSOR ASSEMBLY

Develop technology demonstrator using staring focal planes in stabilized systems for light vehicle application.

LIGHT ARMORED VEHICLE EVALUATOR

Provide low cost night vision systems capability for light armored vehicles in support of the Rapid Deployment Force.

LOW POWER LASER PULSERS

Develop compact, long life power conditioners for Mi Rangefinder, X-Wind Sensor (CO₂ laser). Develop high rep rate pulser for Laser Radar.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
CECOM	1X463707D246-09-48		H-9
CECOM	1X464701D48735		H-9
ERADCOM	1L162705AH9403 1L263742DF3201		A-13 B-13 C-13 D-16 E-8 F-10 G-16
ARRADCOM	AH91		A-13 B-13 C-13 D-16 E-8 F-10 G-16
ARRADCOM			B-17 C-15
ERADCOM	63710ADK7002		E-10
ERADCOM	63710ADK7002		E-10 F-12
ERADCOM	1L162705 AH94 11-03		B-18A

ENSJNG

TITLE/DESCRIPTION

PE FOCAL PLANE ARRAY FABRICATION TECHNIQUES

Develop a high yield producible process for PV and HgCdTe focal plane array fabrication.

1 MARK III NIGHT SIGHT

Provide automatic cueing and second generation FLIR in M1 Tank and upgrading gunner's performance in target acquisition and positioning.

1 MISS DISTANCE SENSOR

To provide a system capable of determining and automatically correcting for projectile/target miss distance.

MILITARY COMPUTER FAMILY PRODUCT LINE PERIPHERALS

Develop MCF interfaces for product line peripherals (Datametrics 1500 Printer, SAI Technology Plasmascope, an auxiliary memory, and a secondary memory)

MILLIMETER WAVE PHASED ARRAY AND CONFORMAL ANTENNAS

Develop single frequency low cost electronic beam steering arrays.

MINELAND DETECTION UTILIZING RECONNAISSANCE ASSETS

Determine the performance characteristics of existing reconnaissance sensors in a minefield detection role and as a function of climate, vegetation, and target deployment. Estimated performance of those sensors on alternate platforms.

MINI EYESAFE LASER INFRARED OBSERVATION ACT (AN/PVS-6)

Provide low cost, lightweight, eyesafe laser rangefinder for the infantry to 3km.

MINI LASER INFRARED OBSERVATION SET

Provide low cost, two-pound rangefinder for forward observers to 4 KM.

MODULAR SENSOR ASSEMBLY

Develop set of standard components to be used in building sensors with integral sensing, stabilizing and processing for day/night applications. The use of standard components will allow for significant cost reduction due to longer production runs and competition from second sources.

MULTI LINE UV-FIR TUNABLE LASERS

Demonstrate technical feasibility of advanced frequency agile CO₂ lasers and continuously tunable visible NIR lasers.

SENSING

<u>COMMANL</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	6.37.10 DK70-02		H-10A
ERADCOM	63710ADK8701		B-16 G-18
ARRADCOM	AH19-F		G-19
CECOM	1X463723D186.02		H-9
ERADCOM	1L162705AH9497	14.7.1	H-10A
ERADCOM	D608-26		H-10
ERADCOM	63710 DK70-28		H-9
ERADCOM	63710DK70		C-15
ERADCOM	63710DK7017		E-10
ERADCOM	DH95MO		A-12 B-14 C-12 D-18 E-9 F-12 G-17

SENSING

TITLE/DESCRIPTION

MULTI SENSOR SIGNAL PROCESSORS

Develop common (multi-sensor) signal processor for IR/MMW inputs.

MULTI-ENVIRONMENTAL ACTIVE RF SEEKER TEST BED

Develop, test, and evaluate an RF Seeker capable of tracking both stationary and moving targets in clutter.

MULTI-FUNCTION LASER MODULES TARGET ACQ AND ENG

Provide a variety of state-of-the-art carbon dioxide laser devices capable of satisfying a wide variety of operational needs including rangefinding, range rate sensing, crosswind sensing, target acquisition remote chemical agent detection and others.

MULTI-PURPOSE DETECTION SYSTEM

Develop and demonstrate new concepts for detecting mines and explosives in urban terrain where other approaches fail due to interference and obscuration.

MULTI-SENSOR AIR DEFENSE ACQUISITION

Combine an infrared search set with a track-while-scan radar and a passive RF Sensor for short range air defense target acquisition.

MULTI-SENSOR TARGET ACQUISITION SYSTEM (MTAS)

Develop Multi-Sensor target acquisition system for enhanced combat capability. The technical approach is to exploit mm wave radar combined with thermal imaging to provide all visibility surveillance/fire direction.

NANOSECOND PULSERS

Develop compact, long life power conditioners for M1 tank rangefinder and X-wind sensor (CO₂ laser).

NCBIFF LASERS

Explore candidates using active lasers of NCBIFF.

NIGHT VISION AUTO SENSOR DEVELOPMENT

Develop a brassboard of a multi-functional processor which can receive inputs from a number of sensors and through various processing modules provide automated functions for simultaneous tracking of targets and automatic recognition.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	DH95-D0		B-18 G-20
MICOM	RE-1		A-14 B-15 C-14 D-17 E-9 F-11 G-16
ERADCOM	DH95-D0		A-12 B-14 C-12 D-18 E-9 F-12 G-18
MERADCOM		6.6.4	H-10
MICOM	RNT-8	4.5.6	A-13 B-13 C-13 D-16 E-8 F-10 G-16
ERADCOM	DK70-31		B-18 G-20
ERADCOM	11162705AH9401		B-16
ERADCOM	DH95		A-14 B-15
ERADCOM	EK70-13		A-12 B-14 C-12 D-18 E-9 F-12 G-18

ENSING

TITLE/DESCRIPTION

OPTICAL CORRELATOR TARGET CUEING (RNT-10)

Demonstrate target cueing and acquisition aided by an optical correlator as applied to missile systems with optical fiber data link.

PERIPHERALS HIGH TECHNOLOGY

Establish technical feasibility of promising new advanced technologies for application to computer peripherals.

PROCESSOR FOR COMMON MODULE FLIRS

Develop prototype digital processors for 1st generation common module to accomplish digital scan conversion (DSC) and automatic target recognition (ATR).

PROTOTYPE 10.6 MICRON CROSSWIND SENSOR

The technical objective is to develop a crosswind sensor capable of integration into a tank fire control system. The operational objective is to increase the probability of first round hits of the main gun by decreasing the meteorological wind error contribution to the error budget of tank gunners.

PROTOTYPE ROBOTIC SENSOR UNIT

Develop a remote controlled semi-autonomous sensor system for remote sensing/intelligence collection with assistance in targeting.

QUIET RADAR FOR AIR DEFENSE

Develop a radar for short range AD having significantly enhanced survivability to ARMs and increased effectiveness in an ECM environment.

RAM HARDENED CO₂ LASER RANGEFINDER COMMON MODULES

Develop a second source advanced development model CO₂ Laser Rangefinder for the M1 Tank. This rangefinder will provide FLIR compatible and improved performance in smoke, haze and fog compared to existing rangefinder technology. Eye safe operation will also enhance training capability.

RAM HARDENING OF RANGING ELECTRONICS

Productize critical common module components for carbon dioxide laser rangefinders which will provide eye safe, FLIR compatible performance in smoke, fog, haze, etc.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
MICOM	RNT-10		H-10
CECOM	1L162701A094Q0		H-9
ERADCOM	DK7013	11.6.1	A-12 B-14 C-12 D-18 E-9 F-12 G-18
ERADCOM	AH71D0		B-17
ERADCOM	DK70-30	8.25.1	A-12 B-14 C-12 D-18 E-9 F-12 G-18
MICOM	RE-12	4.4.1	A-14 B-15 C-14 D-17 E-10 F-11 G-17
ERADCOM	DK70-26		B-19 C-15 F-13 G-19
ERADCOM	DK70-26		B-18 C-16 F-13 G-20

SENSING

TITLE/DESCRIPTION

REBTAM MODELING ACQUISITION EFFECTIVENESS AND ANALYSIS

Provide a reference document to the user community sensors. Volume II will include the dynamic effects of search and obscuration. Provide continuing modeling and analysis of system effectiveness in Battlefield Environment of future Army EO/IR/MMW sensor.

SCATTERMINE DETECTION

Demonstrate the feasibility of detecting air delivered minefields by modification of a sensor system developed for other purposes.

SECOND GENERATION FOCAL PLANE - ADVANCED FLIR TECHNOLOGY (AFT)

To advance the state-of-the-art of scanned 8-12 micron infrared focal plane technology aimed at increasing thermal sensitivity, thus increasing range performance of thermal imaging sights in both good and degraded weather conditions.

SENSOR FIELD EVALUATION

Evaluate EO/IR/MMW sensor performance and validate models under realistic battlefield conditions for modeling and analysis.

SMART SENSOR MODELS

Generate E-O sensor, MMW radar, and smart sensor models for future design optimization and conclusion in battlefield simulation and analysis.

SS 94 GHz TRANSMITTER/RECEIVER MODULE

Provide low cost transceiver modules for pulsed, FMCW or FSK radars at 35-100 GHz.

STABILIZATION TECHNIQUES

Develop stabilization techniques to reduce cost of platforms for FLIRs, lasers and mm radar, and to improve weapon system accuracy.

TARGET BACKGROUND SIGNATURES AND ENVIRONMENTS

Develop target signature characteristics for guidance systems, evaluate sensors and guidance systems in smoke, dust, and adverse weather.

TERRAIN EFFECTS OF VISIBILITY AND LINE-OF-SIGHT WEAPONS

Simulate visibility and line-of-sight weapons opportunity for engagement under the constraints of environmental conditions.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	1L162709DH95/S0		H-10
MERADCOM		6.6.3	H-9
ERADCOM	6.27.09, DK95/A0		B-16 C-15 E-10 F-13 G-20
ERADCOM	1L162709DH95		H-9
ERADCOM	62709DH9550	11.9.3.	H-10
ERADCOM	1L162705.AH94.07	14.6.1	H-10A
ERADCOM	DK7C-02		B-19 C-16 F-13 G-20
MICOM	RE12		A-13 E-13 C-13 D-16 E-8 F-10 G-16
USAEWES	4A762730AT42/BE3/003		H-10A

SENSING

TITLE/DESCRIPTION

TERRAIN SIGNATURE CHARACTERIZATION FOR MINE/MINEFIELD DETECTION

Develop background signature data bases formatted specifically for efficient use in the design and evaluation of concepts and hardware for mine/minefield detection.

THERMAL WEAPON SIGHT

Provide family of lightweight, manportable weapon and surveillance FLIRS with modular design using advanced cooling and second generation focal plane arrays.

TUNABLE FILTERS, OPTICAL SWITCHES

Develop techniques to acquire and/or negate performance of enemy targets.

VEHICLE DYNAMICS SENSOR

To provide low cost sensors which will provide information on on-vehicle dynamics to the FC processor. Where appropriate, compensation will involve sensor definition, placement, and development of compensation techniques.

WIDE AREA NEUTRALIZATION DEVICE (WAND)

Provide acoustic, seismic, magnetic, etc., signatures of combat vehicles that will defeat remote mines equipped with sophisticated sensors.

XM22 AUTOMATIC CHEMICAL AGENT ALARM (ACADA)

To develop a new generation alarm with a multi-agent capability. The alarm will be used for area warning to warn personnel to mask, to monitor inside collective protected shelters, vans, and vehicles, and to warn of contaminated surfaces using the principle of Ion Mobility Spectrometry.

SENSING

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
USAEWES	4A76219AT40/BO/039		H-10A
ERADCOM	DK7017	15.8.1	A-12 B-14 C-12 D-18 E -8 F-11 G-17
ERADCOM	DH95-P0		B-18 C-16 F-13 G-20
ARRADCOM	AH91		A-14 B-15 C-14 D-17 E -9 F-10 G-16
MERADCOM		6.5.1	B-19 C-15 G-19
ARRADCOM	1U463721D601-06		A-14 B-19 C-16 D-16 E -8 F-13 G-20

SUPPORT

TITLE/DESCRIPTION

ADVANCED MAIN-TANK INTEGRATION STUDIES

Apply state-of-the-art display technology and research to a prototype tank command control and display. Review state-of-the-art vehicle navigation systems and display technology and develop prototype hardware. Fabricate, install, and test a prototype-enhanced response system.

ADVANCED PROGNOSTICS

To establish a technology base for prognostics in order to: identify failing systems, reduce extent of failure, provide Unit Commander knowledge of his vehicle condition, increase vehicle availability and provide ATEPS with prognostic capability. The 6.3 activity will provide advanced development or prognostic algorithms with applications in brass board hardware for demonstration and verification.

COMBAT DAMAGE PREDICTION, DIAG, AND EXPED REPAIR

Develop methodologies for prediction of battle damage, and manpower and material requirements for evacuation and repair. Develop methodologies for determining actual battle damage by the field soldier. Develop and document methodologies for expedient repair of battle damage.

COMBAT REFUELING

Provide system(s) for rapid refueling of combat vehicles. Reducing travel time to and from supply points will increase available combat time.

ESTABLISH STRESS LEVELS ON CREWS

Quantitatively measure combat vehicle crew stress levels and performance decrements during extended continuous operations. Measure the performance of combat vehicle crew for four (4) men vs. three (3) man crew (assuming auto-loader application).

FORWARD AMMUNITION SUPPLY AND TRANSFER

Improvement of the ammunition supply procedures and material handling equipment. Conduct a study and review the problems associated with the retail delivery of ammunition.

INFORMATION REQUIREMENTS FOR COMMAND & CONTROL

Apply state-of-the-art display technology and research to a prototype tank command and control display. Phase I, using the German Interactive Simulator (APKA) to conduct a force on force evaluation of providing tank platoon leaders with graphic displays of terrain and selected intelligence data, will be conducted in Germany during Nov 82.

SUPPORT

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
USAHEL			A-15 B-20 C-17 D-19 E-11 F-14 G-21
TACOM		2.4.10	B-20 C-17 F-14
USA LOG CEN	ACN46495		H-11
MERADCOM			A-15 B-20 C-17 D-19 E-11 F-14 G-21
HEL			H-11
HEL	1L162716AH70		H-11
HEL			A-15 B-20 C-17

SUPPORT

TITLE/DESCRIPTION

MATERIAL HANDLING EQUIPMENT & SUPPLY DIST

Develop the technology base required to support trade-off analysis of integrating ammo handling equipment- even robotics-into the Forward Ammo Resupply System. This ammo handling equipment will enhance effectiveness in the harsh battlefield environment of NBC, smoke, and light because ammo will be transferred with personnel remaining under armor.

MICROCLIMATE CONDITIONING SYSTEM (MCS)

To provide cooling for the combat vehicle crewman by means of a vest worn between his underwear and his outer garments. A coolant (either liquid or air) is pumped through the vest via a closed-circuit system providing cooling to the torso. Inclusion of a skull cap to be worn under the helmet is also being considered.

NATO COOPERATIVE ACTIVITIES

Achieve standardization and interoperability with NATO allies throughout the materiel system development process. Develop equipment standardization agreements, conduct cooperative research program, initiate cooperative logistics programs and initiate codevelopment/coproduction programs.

NBC DECONTAMINATION

Develop equipment for decontamination of both the interior and exterior of combat vehicles. Equipment is based on a systems approach to also protect personnel during the decontamination process. It permits reclaiming NBC contaminated vehicles to permit their recommitment to the battle or operational status.

NBC EFFECTS ON A COMBAT ASL/PLL

To develop methodology and techniques wherein the impact of an NBC environment on vehicle hardware can be determined. This information could then be used to update Combat ASL/PLL methodology which currently concerns itself with damages incurred in conventional warfare. The overall objective of this program is to insure that optimum Combat ASL/PLL's are developed which reflects expected combat environments.

NBC RECON SYSTEM

To provide an NBC system to include vehicle to conduct detailed ground NBC recon within, to the front, flanks, and to the rear of the Div (Div Cav), Corps (ACR) and Echelons above Corps (EAC) on a mission basis; conduct lines of communication (LOC) NBC surveillance and assist troop movement within and through the Div/Corps/EAC AO; conduct internal NBC surveillance to facilitate rear area combat operations (RACO); position and monitor remote sensors in support of Div/Corps/CAC Surveillance plans; collect agent sample for analysis.

SUPPORT

COMMAND

PROJECT NO.

DARCOM PLAN PARA NO.

ACV S&T PLAN PG NO.

MERADCOM

A2H20SC0631

A-15 B-20 C-17 D-19
E-11 F-14 G-21

TACOM

A-15 B-20 C-17 D-19
E-11 F-14 G-21

TACOM

H-11

TACOM

A-15 B-20 C-17 D-19
E-11 F-14 G-21

AMSAA

H-11

ARRADCOM
(CSL)

C-17 D-19 E-11 F-14

SUPPORT

TITLE/DESCRIPTION

POWER TRANSMISSION FLUIDS

Select corrosion inhibited power transmission fluid for turbine engine/transmission system. Longer more reliable turbine engine operation. Engine and related testing to screen candidate formulation. The best will proceed to operational engine tests.

RAM-D COMPONENTS

Develop a methodology for realistically selecting RAM-D goals of combat and other vehicles. Develop a method of setting a minimum threshold RAM-D values that must be exceeded before the combat vehicle adds rather than subtracts from combat effectiveness. Develop a combat effectiveness vs. RAM-D level relationship using operation research disciplines so that the impact of early design changes can be effectively justified using battlefield effective measures. Apply methodologies developed to product improvement programs.

RAM-D PREDICTION METHODOLOGY

To develop new methodologies for predicting the RAM-D of components and combat vehicle systems prior to initiation of development and during the development program. The overall objective is to insure that RAM-D parameters are apportioned down to the lowest practical subsystem so that proper management can be given to insure that levels of RAM-D are achieved that are both cost effective and attuned to required combat capabilities.

REPAIRABILITY TECHNOLOGY

To establish a methodology and approach for achieving the capability for rapid repair of tanks and related support vehicles when engaged in combat operations. The methodology is intended to lead to identification of most frequent repair actions and concepts established for the design of components that can be quickly repaired by the crew or operators at the organization level.

SUPPORT

COMMAND

PROJECT NO.

DARCOM PLAN PARA NO.

ACV S&T PLAN PG NO.

MERADCOM

B-20

AMSAA

H-11

AMSAA

H-11

AMSAA

H-11

SURVIVABILITY

TITLE/DESCRIPTION

ADIABATIC DEFORMATION AND BALLISTIC PENETRATION OF ARMOR PLATE

Define metallurgical parameter relationships to ballistic resistance of armor materials (steels) by plugging-adiabatic shear and thereby provide guidelines for armor improvement.

ADVANCED ARMOR MATERIAL APPLICATION

Evaluation of new armor materials and/or systems for combat vehicle applications.

ADVANCED COUNTERMEASURES/VEHICLE INTEGRATION DEFENSE SYSTEM

Advanced development of acoustically and optically based systems for the detection of battlefield threats to combat vehicles and the selective integration of threat detection/warning location and identification display and countermeasures hardware into combat vehicle self-protection systems.

ADVANCED MATERIAL SYSTEMS FOR ARMY APPLICATIONS

Develop advanced material systems applicable to armored combat vehicle to defeat multi-threat mix.

ANTI-LASER PAINT

Develop anti-laser tunable camouflage paints that will effectively absorb low energy laser radiation with wavelengths below 3.0 microns. This will render ineffective lasers used to aid weapon systems (examples include laser target designators, rangefinders, and lasers).

ARMOR APPLICATIONS OF TEXTURED MATERIAL

Develop specially processed textured steels and other materials (aluminums, titaniums) for improved ballistic/mechanical properties.

ARMOR DEVELOPMENT AND DEMO PROGRAM

To enable prototype demonstration and scaled-up of advanced armor techniques through full scale test or adaption to test beds. Program will identify future areas of interest for rapid development, scale-up and demonstration.

ARMORED VEHICLE SYSTEMS MODEL

Develop mathematical models for comparing relative effect of mobility, firepower, and armor protection of combat vehicles. Develop mathematical/computer models of ballistic phenomena to predict interior, exterior, and terminal performance of fighting vehicles armaments. Conduct systems studies using these models.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
AMMRC	1L162105AH84		H-12
TACOM	1L162601AH91		H-14
TACOM	1L263631D014		A-16 B-21 C-18 D-20 E-12 F-15 G-22
AMMRC			H-13
MERADCOM	1L161102AH51C		H-15
AMMRC	1L162105AH84		H-13
TACOM	1L63636D221		A-17 B-22 C-19 D-21 E-13 F-16 G-23
ARRADCOM (BRL)	1L162618AH80		H-17

SURVIVABILITY

TITLE/DESCRIPTION

AUTOMATIC TARGET RECOGNIZER DIGITAL IMAGERY DATA BASE

Develop target and background signature image processing techniques for smart sensors and automated weapons systems and weapons effectiveness studies. Measure and characterize significant features of targets in EO/IR/MMW spectral bands for smart sensor seeker performance assessment and target acquisition modelling. Maintain data base for resulting signatures.

CHEMICAL AND BIOLOGICAL DECONTAMINATION AND CONTAMINATION AVOIDANCE

Evolve materials and equipment for use in the decontamination of personnel, personnel items, and TO&E equipment by all armed services. Included are studies to allow for ease and speed of decontamination to the optimal degree practicable. Also investigate procedures designs and materials which preclude chemical, biological, and radiological contamination. Included are studies on the basic properties of contaminants which support the development of methods of avoiding or minimizing contamination.

CHEMICAL DETECTION AND IDENTIFICATION TECHNOLOGY-NBC RECONNAISSANCE SYSTEM

Develop an NBC Reconnaissance System capable of locating and identifying contaminated areas.

CHEMICAL WARFARE AGENT-RESISTANT MATERIAL FOR COMBAT VEHICLES

Development of organic polymers with improved resistance to CW agents and decontaminants.

CHEMICAL-BIOLOGICAL THREAT ASSESSMENT TECHNOLOGY

Monitor intelligence information and available assessment technology, quantify threat to best degree possible.

COLLECTIVE PROTECTION MATERIAL

Develop Hybrid Collective Protection Equipment (HCPE) and address other related NBC defensive/survival considerations pursuant to PL 95-79 so as to afford improved defendability of combat vehicle crews to an NBC warfare threat.

COMBAT VEHICLE ENVIRONMENTAL SUPPORT SYSTEMS

Develop Environmental Support Systems (ESS) common to a number of ground combat vehicles which may be used in connection with collective protection. Allow vehicle to operate "buttoned-up".

COMBAT VEHICLE ROBOTICS

Establish a robotics program plan which defines the role of robotics/artificial intelligence in future combat vehicle development, and to implement programs which address survivability aspects of Air/Land Battle 2000.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ERADCOM	1L162709 DH95/50		H-15
ARRADCOM	1L162706A553		H-16
ARRADCOM (CSL)	1L162706A353		H-16
AMMRC			H-14
ARRADCOM (CSL)	1L162706A553A0		H-16
TACOM	1M463721DJ30		A-16 B-21 C-18 D-20 E-12 F-15 G-22
MERADCOM	1L463726DK39		A-16 B-21 C-18 D-20 E-12 F-15 G-22
TACOM			B-22 G-24

SURVIVABILITY

TITLE/DESCRIPTION

COMPARTMENTING

Development of combat vehicle ammunition compartment design criteria and prototype hardware which will reduce catastrophic vehicle kills caused by detonation of on-board ammunition.

DECOYS

Conduct an analysis of the use of the force multiplier potential of using decoys in European combat scenario.

DEFORMATION STRENGTHENING OF ALUMINUM ARMOR

Control deformation strengthening mechanisms in a superior experimental alloy.

DEVELOPMENT AND TESTING OF LASER HARDENED MATERIALS AGAINST PULSED THREATS

Develop advanced transparent materials/composites to optimally defeat HEL threats.

DEVELOPMENT OF ARMOR PLATE WITH IMPROVED SHATTERING RESISTANCE

Improved shattering resistance of steel armor under ballistic attack by metallurgical and processing procedures.

DEVELOPMENT OF BALLISTIC DATA FOR ARMOR MATERIALS

Generate, correlate, catalog and disseminate ballistic data in the form of a "Ballistic Handbook" for metallic, ceramic, and polymeric armor materials.

DEVELOPMENT OF HIGH STRENGTH HOMOGENEOUS ALUMINUM ALLOY

Improve mechanical properties, ballistic resistance, weldability, and stress corrosion of high strength aluminum alloy via alloying elements, thermal-mechanical and quenching treatments.

DEVELOPMENT OF LIGHTWEIGHT PERSONNEL ARMOR MATERIALS TO DEFEAT ADVANCED THREATS

Develop lightweight materials systems for personnel armor applications (vests/helmets) to optimally defeat advanced threats.

DEVELOPMENT OF SPALL SUPPRESSION LINERS

Develop advanced lightweight armor materials systems possessing effective spall suppression and resistance to fragment penetration in configurations applicable within tank hull/turrets.

DEVELOPMENT OF ULTRA HI-STRENGTH STEEL PROCESSING

Develop high strength higher toughness steel armor material with low critical elements such as Ni and Cr.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM	1L162601AH91		H-14
MERADCOM	1L162733AH20		H-15
AMMRC			H-12
AMMRC	1L162105AH84		H-17
AMMRC	1L162105AH84		H-13
AMMRC	1L162105AH84		H-15
ARRADCOM			H-12
AMMRC	1L162105AH84		H-16
AMMRC	1L162105AH84		H-14
AMMRC	1L162105AH84		H-13

SURVIVABILITY

TITLE/DESCRIPTION

DIRECT ENERGY BEAM REDUCTION

Assess threats from directed energy beam weapons and determine techniques/materials which can potentially absorb/reflect/diffuse the beams.

EFFECT OF IMPURITY ELEMENTS IN DEFORMATION STRENGTHENING OF ALUMINUM ARMOR

To understand the effects of alloy chemistry on strengthening mechanisms and stress corrosion of aluminum alloys.

EO/LASER COUNTERMEASURE TECHNIQUES

(Project description is classified CONFIDENTIAL.)

FACE MASK, COMBAT VEHICLE CREWMAN'S

Develop a face mask that will provide combat vehicle crewman protection against flame, dust, wind, and low velocity fragments.

FAILURE CRITERIA IN PENETRATION MECHANICS

Guide development of advanced armor materials systems through stress/strain failure analysis and understanding of complex penetration mechanisms.

FIRE SURVIVABILITY TECHNOLOGY

Execute and integrate all near-, mid-, and long-term DARCOM programs that significantly reduce the catastrophic loss of vehicles from fires.

FUELS & LUBRICANTS: FIRE-RESISTANT FUELS

To develop a fire-resistant fuel (FRF) for use in armored vehicles while operating in hostile environments. The use of this fuel will greatly reduce pool-burning associated with combat damage. Its use will significantly reduce the vulnerability hazards associated with fire threat problem. The FRF is intended to be used only during periods of combat/hostile actions.

FUELS AND LUBRICANTS: FIRE-RESISTANT HYDRAULIC FLUID

To develop a non-flammable hydraulic fluid to be used in armored combat vehicles. The adaption of this fluid in conjunction with the Fire-Resistant Fuel will greatly enhance the overall survivability of armored combat vehicles.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM	1L162601AH91		A-17 B-22 C-19 D-21 E-13 F-16 G-23
AMMRC			H-12
ERADCOM	1L762715 A042		H-15
NLABS	2G464713 DL40-96		A-18 B-23 C-20 D-21 E-13 F-16 G-23
AMMRC	1L162105AH84		H-15
TACOM	1L162601AH91	2.6.4.	H-12
MERADCOM	1L263104D150		H-14
MERADCOM	1L263104D150	21.6.14	H-14

SURVIVABILITY

TITLE/DESCRIPTION

HELMET, COMPATIBLE, COMMUNICATION/AURAL PROTECTIVE SYSTEM

Develop a small, lightweight, low-cost standard combat helmet compatible, detachable communications and/or aural protective system of headsets for the individual soldier for mounted/dismounted operations.

INTEGRATED COUNTERMEASURES TEST BED

Test bed will integrate and evaluate nonarmor solutions to vehicle defensive problems. One aspect of this approach is passive countermeasures to terminally homing munitions and threat acquisition devices.

INTEGRATED CVC CLOTHING SYSTEM

Incorporate chemical protection into the existing CVC uniform.

INTERFACE NAVY SHIP STRUCTURAL PROTECTION PROG

A materials and data base development program directed at defeat of large mass fragments for both conventional munition, burst velocities and hypervelocities.

KE PENETRATOR TECHNOLOGY/PENETRATION MECHANICS

Improve state-of-the-art in penetration mechanics. Establish and maintain a KE penetrator capability to defeat future armor threats.

LIGHTWEIGHT COMBAT VEHICLE COMPOSITE COMPONENTS

Develop composite constructions and manufacturing processes applicable for both armor and structure for vehicle components including hull construction. Reduced weight and/or improved ballistic performance and cost reduction are desired.

LIGHTWEIGHT PROTECTIVE ARMOR FOR CONTAINERS

Develop optimal lightweight materials systems incorporating state-of-the-art technology to defeat 7.62mm AP projectiles. These systems will also be tested/evaluated versus a mix of threats including fragments, Ball and AP projectiles. Optimal systems emerging from this investigation will have applicability for future lightweight combat/logistics vehicles.

LOW VULNERABILITY PROPELLING CHARGE (LOVA)/REDUCED VULNERABILITY TANK GUN PROPELLING CHARGES

Improve processing technology for extrusion of multi-perforated grains of low vulnerability propellant. Produce propellant for test firing in M68 gun. Improve binder energetics and investigate production of ultrafine HMX and RDX particles.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
NLABS	2G464713 DL40-20		C-20 D-22
TACOM		2.8.3	B-22 C-19 G-24
NLABS	1G263747D669-9Y		A-18 B-23 C-20 D-22 E-14 F-16 G-23
AMMRC			H-12
ARRADCOM (BRL)	1L162618AH80	21.6.1	B-23 C-20 E-14 F-16 G-24
AMMRC	1L162105AH84		H-16
AMMRC	A99QAXFB		H-16
ARRADCOM (BRL)	1L162618AH80	19.6.4	H-16

SURVIVABILITY

TITLE/DESCRIPTION

MATERIALS/STRUCTURES SCALE-UP DEMONSTRATION

To demonstrate the feasibility of composite armor construction for the turret of M2/M3 vehicles.

MICROCLIMATE CONDITIONING SYSTEM

Regulate body temperature of crewmen by means of a microclimate conditioning system.

MULTI-THREAT COMPOSITE ARMOR SYSTEMS

Develop lightweight composite armor systems for integrated threat protection.

MULTIFUNCTIONAL ARMOR SYSTEM FOR DEFEAT OF TOP ATTACK

Develop lightweight armor materials systems incorporating conventional and state-of-the-art technology to maximize protection against overhead threats (M42 HEAT and GAV-8 KE penetrator for combat ground vehicles.

NBC COLLECTIVE PROTECTION MATERIAL

Apply NBC hybrid/ventilated facepiece protective equipment to user identified combat vehicles/weapon systems under development for improved tactical and operational capabilities, primarily against chemical threats on the integrated on-land battlefield.

NBC PROTECTION FOR COMBAT VEHICLES

Identify chemical, biological and radioactive particulate vulnerabilities of combat vehicles. Develop hybrid collective protection equipment.

NBC TECHNOLOGY

Develop and evaluate advanced NBC protective equipment and materials for vehicle and crew protection.

NOVEL MATERIAL SYSTEMS FOR ARMY APPLICATIONS

Develop exploratory and advanced novel materials systems for applicability to armored combat vehicles.

PASSIVE COUNTERMEASURES

Develop concepts for minimizing acoustic, photometric, infrared, laser and radar signatures of current and future combat vehicles.

REACTIVE AND ADVANCED PASSIVE ARMOR

To develop weight efficient armors for new AFV's and potential retrofit, PI on battle appliques for existing AFVs and to defeat KE and CE threats.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
AMMRC	1L16310D071		H-13
NLABS	1G263747D669		A-16 B-21 C-18 D-20 E-12 F-15 G-22
AMMRC	1L162105AH84		H-12
AMMRC			H-17
TACOM	1M464735D023		H-14
ARRADCOM (CSL)	1M463721DJ30		H-14
TACOM	1L162601AH91	2.6.9	A-16 B-21 C-18 D-20 E-12 F-15 G-22
AMMRC	1L162105AH84		H-13
TACOM			A-17 B-22 C-19 D-21 E-13 F-15 G-22
ARRADCOM	1L162618AH80	18.6.1.	H-13

SURVIVABILITY

TITLE/DESCRIPTION

REDUCED COST OF ADVANCED MATERIAL

Low cost high performance ceramics are needed in large quantities. This program will be aimed at cost reduction of ceramics. Currently employed ceramic armor materials are processed by hot pressing, an expensive batch process where sizes are limited by availability of high temperature die materials. Processing of ceramic armor materials by several different sintering techniques will be explored in this program. Sintering techniques are more amenable to mass production and lower costs because large continuous tunnel kilns can be used, and product sizes can be larger because of greater flexibility in tooling. Another part of this program will be the development of techniques to make low cost starting powders to further lower costs of ceramic armor materials.

SECURE LIGHTING

Develop secure lighting systems for all current and future combat vehicles through changes in component design and application of suppression techniques.

SIGNATURE SUPPRESSION

Formulate and prepare a computer routine for generating infrared and thermal signature models of armored vehicles suitable for interface with existing weapon performance models.

STANDARDIZED FIRE SUPPRESSION COMPONENTRY

To reduce the major cause of severe damage and casualties in combat vehicles by detecting and suppressing explosive fires within vehicles.

STINGRAY, COMBAT VEHICLE SELF PROTECTION (CVSP)

(Project description is classified CONFIDENTIAL.)

TACTICAL REFLECTED AND EMITTED ENERGY SUPPRESSION SYSTEM (TREESS) CAMOUFLAGE RESEARCH

Develop a multi-spectral, modular camouflage system capable of preventing detection/location/recognition of ground-based tactical equipments, including armored vehicles, by visual, thermal, and radar (millimeter and centimeter) sensors. Prototype components employ thin multi-layer, multi-spectral films configured as screens or artificial foliage.

TANK TEST BED

Explore mid-term (1988-1992) options for advanced vehicle designs which significantly increase tank survivability and operational characteristics through innovative integration of the current technology and component base.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
AMMRC	1T16302D071		H-16
TACOM	1L162601AH91		A-17 B-22 C-19 D-21 E-13 F-15 G-22
TACOM	1L161102AF22		H-12
TACOM	1L162601AH91	2.6.5.	A-16 B-21 C-18 D-20 E-12 F-15 G-22
ERADCOM	6.37.62DK16		A-17 B-22 C-19 D-21 E-13 F-16 G-23
MERADCOM	1L161102AH51C		H-15
TACOM	1L26302D118	2.8.1	B-23 G-24

SURVIVABILITY

TITLE/DESCRIPTION

TECHNOLOGY BASE EFFORTS IN INFRARED SCREENING

Evolve new principles and concepts for smoke/obscurant agents, dissemination devices and delivery means to counter anticipated threats in the visual through far-IR spectral regions.

TECHNOLOGY BASE EFFORTS ON MULTI-SPECTRAL SCREENING

Evolve new principles and concepts for multi-spectral screening agents, dissemination devices and delivery means to counter anticipated threats.

TERMINALLY GUIDED SUBMUNITIONS/OVERHEAD ARMOR

Establish optimum design matrix for armor system(s) with the capability to defeat modern, terminally guided, anti-armor, overhead submunitions at minimum weight.

TRANSPARENT POLYURETHANE ELASTOMERS

Develop appropriate transparent polyurethanes that possess resistance to BC agent penetration.

VEHICLE EFFECTIVENESS TECHNOLOGY

Development of computer aided design (CAD) software incorporating existing survivability, vulnerability, and vehicle performance submodels into an overall vehicle effectiveness model.

VEHICLE HARDENING (ARMOR AND COMPONENTS)

Mathematical computer software which supports design of vehicle structure and components to survive non-penetrating hits.

VEHICLE HARDENING (TRACK & SUSPENSION)

Exploit the composite material technology to design tank roadwheels and track concepts using energy absorbing materials that absorb or deflect mine blast.

VEHICLE IMAGE CONTROL

Replicate false vehicle signatures through cue feature generation, false target source emission, and spacial, spectral and target intensity modifiers.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
PM SMOKE	1L161102A71A	7.11.1	A-18 B-23 C-20 D-21 E-13 F-16 G-23
PM SMOKE	1L161102A71R	7.11.2	A-18 B-23 C-20 D-22 E-14 F-16 G-23
TACOM	1L162601AH91		H-17
AMMRC	1L162105AH84		H-16
TACOM	1L162601AH91		H-12
TACOM			H-13
TACOM	1L263631D424	2.6.3	A-16 B-21 C-18 D-20 E-12 F-15 G-22
TACOM			H-13

SURVIVABILITY

TITLE/DESCRIPTION

VEHICLE RADIATION SHIELDING

Develop and apply the capability to calculate the radiation shielding protection to personnel and electronic systems inside armored vehicles. Determine the military value of adding selective radiation shielding to armored vehicles for personnel protection from initial nuclear radiation.

VULNERABILITY/VULNERABILITY REDUCTION

Develop witness plate methodology for characterizing behind-armor debris produced by the perforation of steel armor targets by kinetic energy penetrators and shaped charges.

XM22 AUTOMATIC CHEMICAL ALARM AGENT

Develop a new generation alarm with a multi agent capability. The alarm will be used for area warning to warn personnel to mask, to monitor inside collective protected shelters, vans, and vehicles, and to warn of contaminated surfaces using the principle of Ion Mobility spectrometry.

SURVIVABILITY

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
ARRADCOM (BRL)	1L162120AH25		H-14
ARRADCOM (BRL)	1L162618AH80	2.6.6.	H-15
ARRADCOM	1U463721D601		A-17 B-22 C-19 D-21 E-13 F-16 G-23

VETRONICS

TITLE/DESCRIPTION

ADVANCED DIAGNOSTICS (6.2)

To provide a technology base for vehicle diagnostic techniques and test equipment to provide the forward support mechanic with a simple and effective means of diagnosing vehicle malfunctions. The emphasis is on techniques and test equipment to enable a rapid and easy means to acquire diagnostic information to expand diagnostic capability.

ADVANCED DIAGNOSTICS (6.3)

Provide advanced development of diagnostic technology gained from the 6.2 program to demonstrate hardware application feasibility to the Simplified Test Equipment family in order to provide the forward support mechanic with simple and effective means of rapidly diagnosing malfunctions to: reduce diagnostic time, increase diagnostic capability, increase vehicle availability, reduce logistic support costs, and simplify training.

ADVANCED PROGNOSTICS (6.2)

To establish a technology base for prognostics in order to: identify failing systems, reduce extent of failure, provide Unit Commander knowledge of his vehicle condition, increase vehicle availability and provide vetronics with prognostic capability.

ADVANCED PROGNOSTICS (6.3)

Provide advanced development of prognostic algorithms with applications in brass board hardware for demonstration and verification. Hardware and software developed on the 6.2 program will be utilized. Output will be applied to the vetronics program.

ATEPS PROTOTYPE DEV (6.3)

Install and test ATEPS Hull Prototype Hardware in a baseline M1 and develop ATEPS Turret Prototype Hardware. This project consists of removing existing M1 Hull and Turret Hardware, finding optimum location of the ATEPS core elements, designing and fabricating interconnecting cables, designing, fabricating and installing the ATEPS Turret Hardware.

ATEPS TECHNOLOGY (6.2)

Initiate the development of a Fiber Optic Data Bus System and slip ring module to replace the current ATEPS twisted pair data bus and brush/ring contacts (slip ring) on a second generation basis. The fiber optic task encompasses conceptual designs for data transmission rates of 1 MHZ, 5 MHZ, and 10 MHZ. The 1 MHZ design will be fabricated. The fiber optic slip ring module will be multi-channel for redundancy and of a configuration to interface with the current M1 hydraulic/pneumatic assembly.

VETRONICS

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM	1L162601AH91	2.4.10	B-24 F-17 G-25
TACOM	1L263631D014		B-24 F-17 G-25
TACOM	1L162601AH91	2.4.10	B-24 F-17 G-25
TACOM	1L263631D014		B-24 F-17 G-25
TACOM	1L263631D014	2.4.8	B-24 F-17 G-25
TACOM	1L162601AH91	2.4.8	B-24 F-17 G-25

VETRONICS

TITLE/DESCRIPTION

COMBAT CREW DISPLAY

Provide a multifunction interactive crew display and associated hardware that presents the following information: Vista Network Data, Navigation Data, Prioritized Threat Data generated by on-board vehicle sensor array, video from on-board FLIR and low light T.V., other vehicle info oriented toward 1986 new thrust demos.

VETRONICS (6.2)

Develop a system architecture and standards for more efficient integration of vehicle electrical/electronics systems and real time integration with the electronic battlefield. Further, to identify technological opportunities and technology transferrable from avionic for application to combat vehicles.

VETRONICS (6.3)

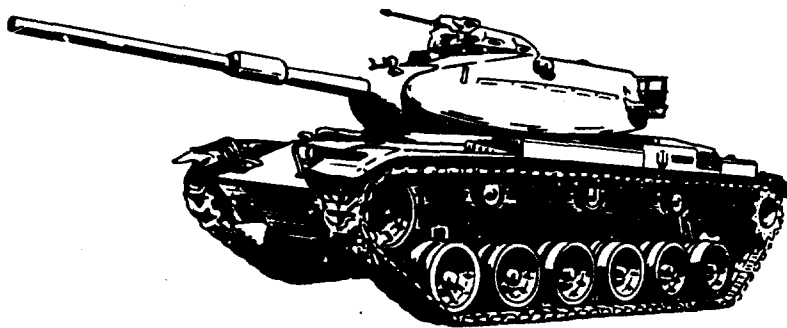
Provide vetronics technology hardware concepts to demonstrate more efficient integration of vehicle electrical/electronic systems and real time integration with the electronic battlefield. Provide for the following vetronics test beds: System architecture, crew display, and maintainability demonstrators.

VETRONICS

<u>COMMAND</u>	<u>PROJECT NO.</u>	<u>DARCOM PLAN PARA NO.</u>	<u>ACV S&T PLAN PG NO.</u>
TACOM			A-19 B-24 F-17 G-25
TACOM	1L162601AH91		B-24 F-17 G-25
TACOM	1L263631D014		B-24 F-17 G-25

M60 SERIES TANK

This combat vehicle is full-tracked and mounts a 105mm M68 gun in a fully traversable turret. The hull and turret are homogeneous-armor castings. The four-man crew consists of a commander, driver, gunner and loader. An AVDS-1790, air cooled, 12 cylinder, turbocharged, compression-ignition engine, rated at 750 HP, is coupled to a CD-850 transmission to provide vehicle power.



M60A1

The M60A1 Tank is equipped with an AVDS-1790-2A, 2C or 2D engine and T97 or T142 Track. The fire control system includes an M13-series mechanical ballistic computer, an M17A1 coincidence optical rangefinder and an M32-series gunner's periscope, employing either an active IR or passive image-intensifier night sight. Gun/turret stabilization is provided by an add-on electro-hydraulic kit.



M60A3

The M60A3 Tank is equipped with an AVDS-1790-2C RISE engine and T142 Track. The fire control system includes an AN/VVG-2 ruby laser rangefinder, an M21 electronic analog ballistic computer and an M35E1 gunner's periscope, employing a passive image-intensifier night sight. Gun/turret stabilization is provided by a system similar to that used in the M60A1 which, in this case, interfaces with the ballistic computer.



M60A3TTS

The TTS improvement consists of an AN/VSG-2 Tank Thermal Sight (TTS). The TTS is a state-of-the-art integral day/night periscope. Its night channel senses emitted radiation in the 8-12 micron spectral band. It provides a truly passive, long range full solution control capability.



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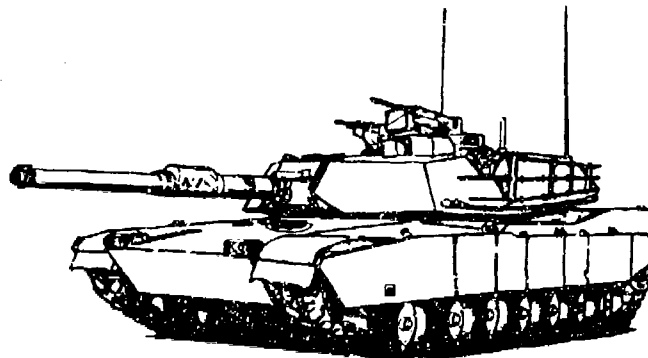
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VETRONICS

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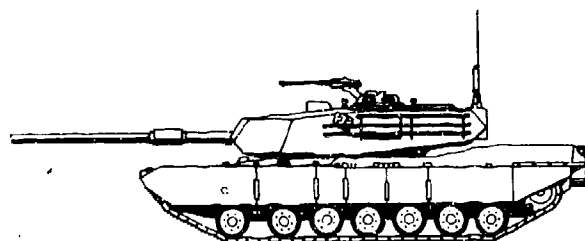
M-1 ABRAMS TANK

This new weapon system is characterized as providing significant improvements to the Army's ground combat power in the areas of armor protection, mobility, firepower and maintainability. The M-1 Tank mounts a large caliber direct fire main gun and three complimentary armament systems. Improved fire control and suspension systems, in conjunction with revolutionary armor protection and compartmentalization of fuel and ammunition, provide a vastly improved fire-on-the-move capability and allow the M-1 to survive on the battlefield while engaging targets at more varied ranges than current tanks.



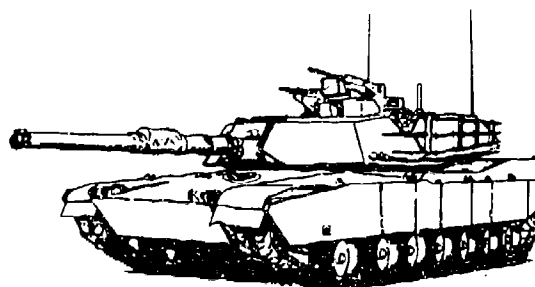
M1 ABRAMS TANK

Our present main battle tank, which has a 105MM gun and turbine engine, is highly maneuverable, hard-hitting and survivable.



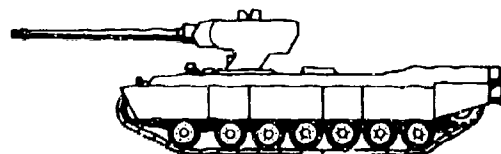
M1A1 TANK

A second generation M1 with product improvements in the areas of armor, NBC Protection, 120MM gun, and weight reduction.



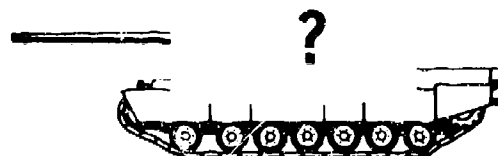
M1 TANK TEST BED

A full up test bed to resolve the critical issues of advanced tank configuration suitability, remote optics, automatic loading, and three-man crew.



M1A2 TANK

A third generation of the M1 Tank may evolve based on the results of the M1 Tank Test Bed Program.



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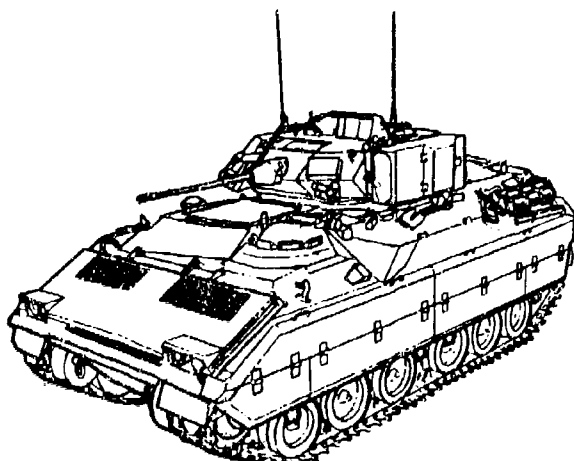
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VETRONICS

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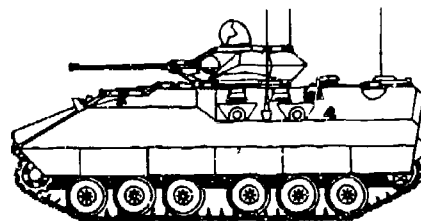
BRADLEY FIGHTING VEHICLES

This vehicle system has the speed and agility to support the M-1 Abrams main battle tank. Firepower is derived from a turret mounted, stabilized, 25mm automatic cannon, a co-axial 7.62mm machine gun and a TOW missile system. The propulsion system is a Cummins 500hp turbocharged diesel. Maximum armor protection for minimum weight through optimal use of the latest armor materials, surface obiquities, and a unique spaced laminate armor system.



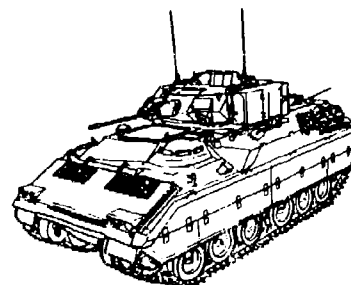
M2 (IFV)

The Infantry Fighting Vehicle is designed to operate with nine men. Six small arms firing ports are provided to allow fighting on the move and under armor. The M2 carries seven TOW missiles and has additional bottom applique armor for increased mine protection.



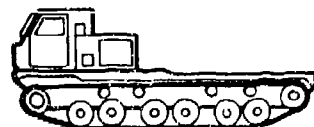
M3 (CFV)

The Cavalary Fighting Vehicle has the same basic design as the M2 vehicle. The M3 is designed for a five man crew and can be utilized for various forward area missions.



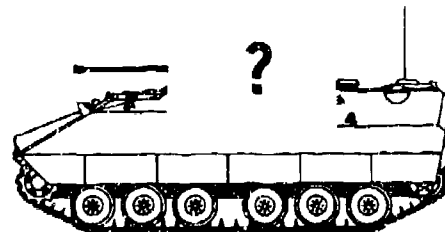
FVS CARRIER WITH MLRS

The Fighting Vehicle System Carrier was developed as part of the Multiple Launch Rocket System which will provide a mobile long range artillery rocket for the support of our ground forces.



IFV TEST BED

This test bed will develop mid-term options for the IFV role that are more survivable and cost effective.



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C3I

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FVS CARRIER PRODUCTION									
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:Information Requirements for Command & Control (page 80)									
/6.2									
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BRADLEY FIGHTING VEHICLE

SURVIVABILITY

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/M2/3 PRODUCTION									
/FVS CARRIER PRODUCTION									
/BIO CHEMICAL PIP									
/TOW II PIP									
/M3 HATCH PIP									
/NUCLEAR HRD PIP									
/IFV TEST BED									
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Collective Protection Material (page 88)									
/6.3b									
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/6.2									
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/6.3a									
Standardized Fire Suppression Componentry (page 98)									
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SURVIVABILITY

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/EVS CARRIER PRODUCTION									
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/TOW II PIP									
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/FVS CARRIER PRODUCTION									
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/TOW II PIP									
/M3 HATCH PIP									
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/TPV TEST BED									
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/FVS CARRIER PRODUCTION									
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/TOW II PIP									
/M3 HATCH PIP									
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:FY83:	:FY85:	:FY87:	:FY89:	:FY91:	:FY93:	:FY95:	:FY97:	:FY99:	:FY01:
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:EVS CARRIER PRODUCTION									
:BIO CHEMICAL PIP									
:TOW II PIP									
:M3 HATCH PIP									
:NUCLEAR HRD PIP									
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:6.3a									
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:6.3b 6.4									
:STINGRAY, Combat Vehicle Self Protection (CVSP) (page 98)									
:6.3									
:6.4									
:Integrated Countermeasures Test Bed (page 94)									
:6.3									

BRADLEY FIGHTING VEHICLE

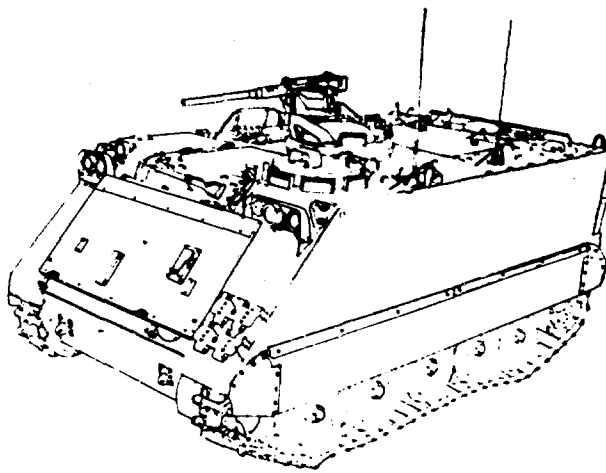
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/FVS CARRIER PRODUCTION									
/RTO CHEMICAL PIP									
/TOW II PIP									
/M3 HATCH PIP									
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M113 FAMILY OF VEHICLES(FOV)

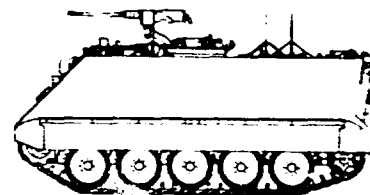
The basic function of this FOV is an armored personnel carrier. These vehicles are powered by a Detroit Diesel engine rated at 212 HP. The drive train consist of an Allison automatic transmission, right angle gear box, controlled differential, and final drive gear powering the vehicles tracks.



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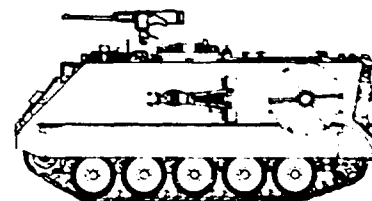
M113A2 ARMORED PERSONNEL CARRIER

Lightly armored, full-tracked combat vehicle which provides transportation for troops or cargo. PIP's include: cooling, suspension, external fuel tanks, heater, stretch, NBC, STE/ICE, XT 150.



M106A2 ARMORED SELF-PROPELLED 107MM MORTAR

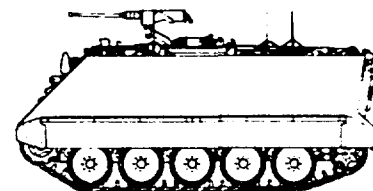
Transports and supports the 4.2 inch mortar M30 during on-carrier and off-carrier tactical operations. PIP's include: cooling, suspension, heater, NBC, STE/ICE, XT 150.



PRODUCTION
PIP

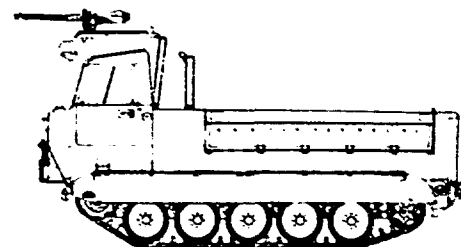
M125A2 ARMORED SELF-PROPELLED 81MM MORTAR

Transports and supports the 81MM mortar during on-carrier and off-carrier tactical operations. PIP's included: colling, suspension, heater, STE/ICE, XT 150.



M548A1 CARGO CARRIER

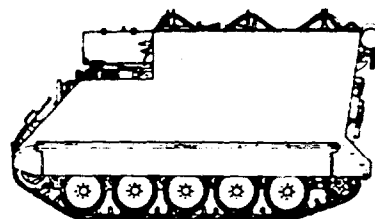
Unarmored, full-tracked vehicle which provides transportation of ammunition and general cargo to forward areas in support of field units. PIP's include: cooling, suspension, stretch, NBC, STE/ICE, ST150, smoke grenade launcher, vented face piece, improved engine access panel.



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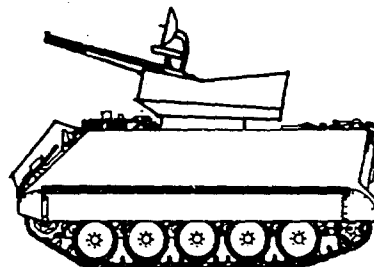
M577A2 ARMORED COMMAND POST

Light tracked command post carrier is a full-tracked light-weight carrier used as operational staff office and command post. PIP's include: cooling, suspension, heater, STE/ICE, XT 150.



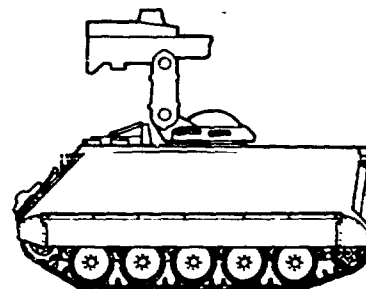
M741A1 VULCAN AIR DEFENSE SYSTEM

Uses the 20MM 6000 rounds per minute machine gun to furnish effective mobile air defense. PIP's include: cooling, heater, NBC, STE/ICE, XT 150.



M901 IMPROVED TOW VEHICLE

This weapon system uses present TOW components mounted on a modified chassis. PIP's include: cooling, suspension, external fuel tanks, heater, NBC, STE/ICE, XT 150, smoke grenade launcher.



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M113 FOV PROGRAM

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PIP									
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:Millimeter Wave (MMW) Wireless Intercell Communication System (WICS) (page 10):									
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:VHSIC Phase 2 Chip Set (page 16):									
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M113 FOV PROGRAM

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FIREPOWER

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M113 FOV PROGRAM

FIREPOWER

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M113 FOV PROGRAM

MOBILITY



MTS POV PROGRAM

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M113 FOV PROGRAM

SENSING

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NEWS FOR PROGRAM

SENSING

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M113 FOV PROGRAM

SURVIVABILITY

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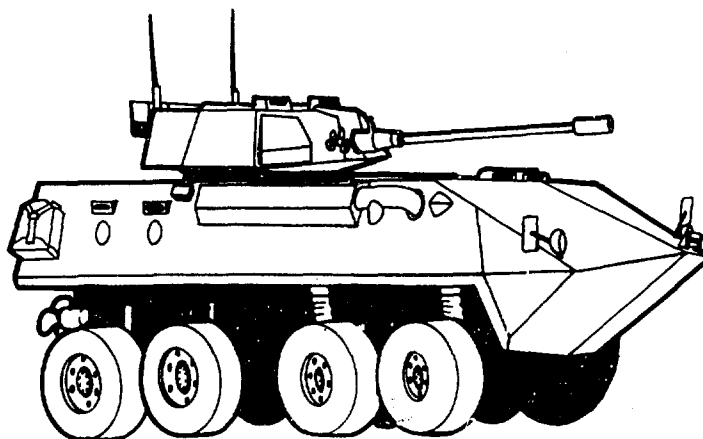
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LIGHT ARMORED VEHICLE

The family of combat Vehicles designated as the Light Armored Vehicle (LAV) improve the operational capability of both the Marine Corps and the Army. The LAV family of vehicles provides a significant improvement in strategic and tactical mobility/transportability over the present heavier systems. The vehicles provide protection against small arms fire and possess amphibious capability.

The most prevalent member of the LAV family is the LAV-25 mounting a stabilized medium caliber main gun and three complementary armament systems. The LAV family includes other vehicles to fulfill the following mission roles: Anti-Tank, Maintenance/Recovery, Command and Control, Logistics and Mortar Carrier. All members of the LAV family utilized the same power plant, drive train and suspension components for logistic commonality.



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/LAV-25 (USA) /									
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/LAV-25 (USMC)									
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Self-Cleaning Air Filter (SCAF) (page 54)									
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ADDEV of Automatic Liquid Agent Detector, XM85, XM86 (page 60)									
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Flat Panel EL Displays (page 70)									
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Multi-Environment Active RF Seeker Test Bed (page 74)									
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LAV PROGRAM

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SURVIVABILITY

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SURVIVABILITY

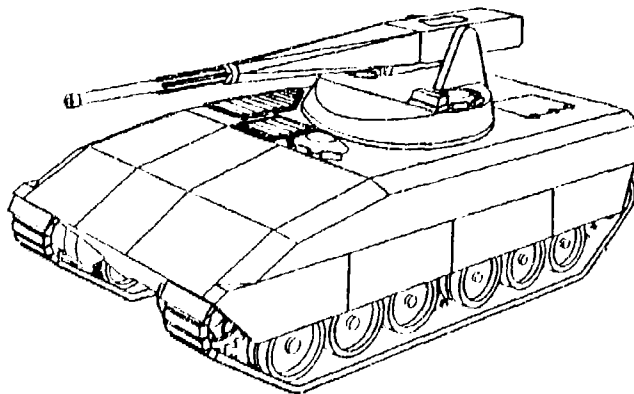
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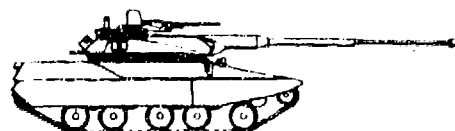
MOBILE PROTECTED GUN SYSTEM

The MPGS will be lightweight and smaller size than the main battle tank and will be used with forward deployed forces and in operations from the lodgement area by contingency forces. A three-man crew will consist of a commander, a driver, and a gunner. The primary armament will be a 75MM antiarmor automatic cannon. The power train will provide approximately 20 HP per ton of vehicle weight. The fire control system will be stabilized in two axes and have a video screen display.



HIGH SURVIVABILITY TEST VEHICLE-LIGHTWEIGHT (HSTV-L)

A 21 ton test bed mounting a 75MM medium caliber anti-armor automatic cannon. The HSTV-L was developed to allow the Armor & Engineer Board to test a lightweight system (capable of being strategically or tactically transported in C141B or C130) which combines all the features necessary to make it an effective anti-armor assault or defensive system. Results of HSTV-L testing were combined with HIMAG tests and used in future lightweight system requirements such as the Mobile Protected Gun System Program.



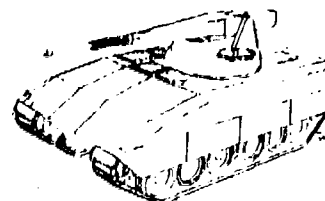
HIGH MOBILITY AGILITY (HIMAG) VEHICLE

A medium weight class variable parameter test bed mounting a 75MM medium caliber anti-armor automatic cannon. The HIMAG was developed to provide the Armor & Engineer Board with a system on which they could vary parameters in order to obtain optimum system performance. Component parameters that can be varied include: suspension spring rates, number of roadwheels, fire control performance levels, gun controls sight displays, etc. Data obtained from HIMAG testing is being used in developing future system requirements.



MOBILE PROTECTED GUN SYSTEM (MPGS)

The configuration and the performance capabilities for this vehicle are currently being defined.



PROTOTYPE / PRODUCTION

C3I

	FY83	FY85	FY87	FY89	FY91	FY93	FY95	FY97	FY99	FY01
	PROTOTYPE		PRODUCTION							
Low Cost Land Navigation (page 10)										
	6.2	6.3a								
Handheld Encryption and Authentication Device (page 8)										
	6.3b									
Power Sources/Advanced Tactical Power Sources (page 12)										
	6.2	6.3b								
Vehicular Intercommunication System (page 16)										
	6.3b	6.4								
Millimeter Wave (MMW) Wireless Intercell Communication System (WICS) (page 10)										
	6.2									
Single Channel Ground and Airborne Radio Subsystem (SINCGARS) (page 14)										
	6.3b									
SOS Frequency Synthesizer (page 14)										
	6.2	6.3a								
VHSIC Phase 2 Chip Set (page 16)										
	6.3									
Tactical Power Supplies (1.5 Kw TEG) (page 14)										
	6.2	6.3a	6.3b	6.4						
Adaptive VHF Radio Appliques for SINCGARS-V (page 6)										
	6.2	6.3a								

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

 C^3_L

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
PROTOTYPE		PRODUCTION							
Small Unit Radio (page 14)									
6.3a		6.3b							
High Power VHF Vehicular Antenna (page 8)									
6.3b									
Military Computer Family (page 10)									
				6.2, 6.3b					
				6.4					
Light Armored Electronic System Carrier (LAESC) (page 10)									
6.3b									
VHSIC Signal Processor Insertion in PJH/Advanced Communications Concept Development (page 16)									
6.3a									
500 Watt VHF Power Amplifier (page 6)									
6.3									
Flat Panel Electroluminescent (EL) Display (page 8)									
VHSIC Phase 1 Chip Set (page 16)									
6.3a									

FIREPOWER

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
<div> <div>PROTOTYPE</div> <div>/</div> <div>PRODUCTION</div> </div>									
Precision Aim Technique (page 41c):									
6.2		6.3a							
LP Technology (page 40):									
6.2		6.3b		6.4					
Light Armored Vehicle Evaluator (page 40):									
6.2									
CO ₂ Laser Rangefinder (page 24):									
6.3b		6.4							
Improved 105mm APFSDS-T (page 36):									
6.3a									
Inertial Component Development (ATAADS) (page 36):									
6.2									

FIREPOWER



MOBILITY

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
<div> <div>PROTOTYPE</div> <div>PRODUCTION</div> </div>									
Combat Mobility Fuels (page 46) <div>6.1, 6.2, 6.3</div>									
Tank-Automotive Tech/Engine Concepts for Alternate Fuels (page 56) <div>6.2</div>									
Transmission Component Development (page 56) <div>6.3</div>									
Lubricants for Conventional/Non-Conventional Engines (page 52) <div>6.1, 6.2, 6.3</div>									
Vehicle Engine Development/Engine Concepts for Alternate Fuels (page 58) <div>6.3</div>									
Corrosion Preventatives (page 48) <div>6.1, 6.2, 6.3</div>									
Advanced Air Filtration (page 42) <div>6.2</div>									
Synthetic and Alternate Fuels (page 56) <div>6.1, 6.2, 6.3</div>									
Self-Cleaning Air Filter (SCAF) (page 54) <div>6.3</div>									

NEWS PROGRAM

MOBILITY

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
<div> <div>PROTOTYPE</div> <div>PRODUCTION</div> </div>									
NBC Resistant Track & Suspension (page 54)									
<div> <div>6.2</div> <div>6.3a</div> </div>									
Fluidic Damper (page 48)									
<div> <div>6.3a</div> </div>									
Low Cost Land Navigation (page 52)									
<div> <div>6.2</div> <div>6.3a</div> </div>									
Track Rubber Development (page 56)									
<div> <div>6.2</div> </div>									
Horizontal Position and Attitude Subsystem (page 50)									
<div> <div>6.2</div> </div>									
Fluidic Heading Reference (page 48)									
<div> <div>6.2</div> </div>									
High Mobility Energy Efficient System (page 50)									
<div> <div>6.3a</div> </div>									
Advanced Composite Materials (page 42)									
<div> <div>6.2</div> </div>									
Drivers Thermal Viewer (page 48)									
<div> <div>6.4</div> </div>									

MPGS PROGRAM

MOBILITY

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
<div> <div>PROTOTYPE</div> <div>PRODUCTION</div> </div>									
Advanced Tactical Power Sources (page 44)									
<div> <div>6.2</div> <div>6.3b</div> </div>									
Track Retention & Control (page 56)									
<div> <div>6.2</div> <div>6.3a</div> </div>									
Advanced Track & Suspension Materials/Structures (page 44)									
<div> <div>6.3a</div> </div>									
NATO/Foreign Track Analysis (page 52)									
<div> <div>6.2</div> </div>									
Advanced Diesel-1000 HP (page 44)									
<div> <div>6.3a</div> </div>									
CVX-650 Hydromechanical Transmission (page 48)									
<div> <div>6.3a</div> </div>									
Adiabatic Engine Program (page 42)									
<div> <div>6.3a</div> </div>									
Advanced Adiabatic Technology (page 42)									
<div> <div>6.2</div> <div>6.3a</div> </div>									

MPGS PROGRAM

SENSING

FY83	FY85	FY87	FY89	FY91	FY93	FY95	FY97	FY99	FY01
PROTOTYPE / PRODUCTION									
Acoustic Sensors (page 60)									
[Redacted]									
Target Background Signature and Environments (page 78)									
[Redacted] 6.2 [Redacted]									
Chemical Alarm Tech (page 66)									
[Redacted] 6.2 [Redacted]									
ADDEV of Automatic Liquid Agent Detector, XM85, XM86 (page 60)									
[Redacted] 6.3b [Redacted] 6.4 [Redacted]									
Flat Panel EL Displays (page 70)									
[Redacted]									
Multi-Sensor Air Defense Acquisition (page 74)									
[Redacted] 6.2 [Redacted]									
Improved Non-Standard Condition Sensors (page 70)									
[Redacted] 6.2 [Redacted]									
Vehicle Dynamics Sensor (page 79a)									
[Redacted] 6.2 [Redacted]									

SENSING

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
<div> <div>PROTOTYPE</div> <div>/</div> <div>PRODUCTION</div> </div>									
Multi-Environment Active RF Seeker Test Bed (page 74)									
6.2									
Acquisition Subsystem (page 60)									
6.2									
Quiet Radar for Air Defense (page 76)									
6.2 6.3a									
Damage Assessment Concepts (page 66)									
6.2									
Dynamic Muzzle Sensing (page 68)									
6.2									
8-14 Micron IRDA (page 60)									
6.2									
Driver's Thermal Viewer (page 68)									
6.4									
Thermal Weapon Sight (page 79a)									
6.3b 6.4									

MEGS PROGRAM

SENSING

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
<div> <div>PROTOTYPE</div> <div>/ PRODUCTION /</div> </div>									
Multi Line UV-FIR Tunable Lasers (page 72) <div>6.2</div>									
Prototype Robotic Sensor System (page 76) <div>6.3a</div>									
Processors for Common Module FLIRS (page 76) <div></div>									
Multi-Function Laser Module Target Acquisition and Engagement (page 74) <div>6.2</div>									
Night Vision Auto Sensor Development (page 74) <div>6.2, 6.3a</div>									
Automatic Target Acquisition (page 64) <div>6.3a</div>									
Advanced Ground to Ground Target Acquisition Radar (page 62) <div>6.3a</div>									
Light Armored Vehicle Evaluator (page 70) <div></div>									
Common Module Multifunction Laser (page 66) <div>6.3a</div>									

SENSING

:FY83:	:FY85:	:FY87:	:FY89:	:FY91:	:FY93:	:FY95:	:FY97:	:FY99:	:FY01:
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PROTOTYPE / PRODUCTION

:RAM Hardened CO₂ Laser Rangefinder Common Modules (page 76):

6.2

:3rd Laser Radar Technology Demonstrator (page 60):

6.2

:Stabilization Techniques (page 78):

6.2 6.3a 6.3b 6.4

:RAM Hardening of Ranging Electronics (page 76)

6.2, 6.3b

Tunable Filters, Optical Switches (page 79a)

6.2

:Second Generation Focal Plane - Advanced FLIR Technology (AFT) (page 78)

6.2

:XM22 Automatic Chemical Agent Alarm (ACADA) (page 79a):

6.2 6.4

SUPPORT

MPGS PROGRAM

SURVIVABILITY

[illegible]

MPCS PROGRAM

SURVIVABILITY

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
<div> <div>PROTOTYPE</div> <div>PRODUCTION</div> </div>									
Direct Energy Beam Reduction (page 92)									
6.3a									
Armor Development and Demo Program (page 86)									
6.3a									
XM22 Automatic Chemical Alarm Agent (page 102)									
6.3b 6.4									
STINGRAY, Combat Vehicle Self Protection (CVSP) (page 98)									
6.3									
6.4									
Face Mask, Combat Vehicle Crewman's (page 92)									
6.4									
Technology Base Efforts in Infrared Screening (page 100)									
6.2									
Technology Base Efforts on Multi-Spectral Screening (page 100)									
6.2									
Integrated CVC Clothing System (page 94)									
6.3b 6.4									
KE Penetrator Technology/Penetration Mechanics Modeling (page 94)									
6.2									
6.3a									

FIXED PROPORTION

VETRONICS

[illegible]

FUTURE CLOSE COMBAT VEHICLES

Future Close Combat Vehicle Study:

This program formulated vehicle concepts based on threat projections, projections of pacing technologies and operational concepts for the 1990-2000 year timeframe. The four prime contractors (FMC, PACCAR, TCM and GD-LSD) submitted their Final Technical Reports to the Army Review Board representatives in early 1982. These reports are currently being evaluated in a cooperative DARCOM/TRADOC effort.

A second phase to the FCCVS program is currently underway which extends the concept formulation into the post 2000 timeframe. The results of this effort will be presented in mid - 1982 and evaluated in the same manner as the preceeding reports.

A sampling of the vehicle concepts from the first phase includes:

- o FMC:
 - High Pressure Gun Tank (45 Ton)
 - Carrier, Hypervelocity Missile (25 Ton)
 - Overwatch, MM Wave & IR Homing Missile (25 Ton)
- o PACCAR:
 - Heavy Force
 - Assault Weapon Vehicle (43 Ton)
 - Infantry Fighting Vehicle (43 Ton)
 - Medium Force
 - Assault Weapon Vehicle (20 Ton)
 - Infantry Fighting Vehicle (18 Ton)
 - Calvary Fighting Vehicle (18 Ton)
 - Anti-Armor Vehicle (20 Ton)
- o Teledyne Continental Motors:
 - Heavy Assault Gun (45 Ton)
 - Heavy Infantry Support Vehicle (40 Ton) o
 - Armored Personnel Carrier (18 Ton)
 - Light Assault Gun (19 Ton)
 - Fire Support Vehicle (20 Ton)
 - Cavalry Fighting Vehicle (20 Ton)
 - ATGM Vehicle (19 Ton)
- o General Dynamics (Land Systems Division):
 - Attack Vehicle (52 Ton)
 - Assault Vehicle (54 Ton)
 - Reconnaissance and Security Vehicle (16 Ton)
 - Long Range Anti-Tank Vehicle (37 Ton)
 - Electronic Attack Vehicle (37 Ton)

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FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
CONCEPT PHASE									
COMP DEV-EXP PROTOTYPE			VALIDATION-FSED-PLT				FOLLOW-ON		
Low Cost Land Navigation (page 10):									
6.2		6.3a							
Handheld Encryption and Authentication Device (page 8):									
6.3b									
Power Sources/Advanced Tactical Power Sources (page 12)									
6.2		6.3b							
Vehicular Intercommunication System (page 16)									
6.3b		6.4							
Small Unit Radio (page 14)									
6.3a		6.3b							
Objective HF Radio (page 12)									
6.2		6.3b							
Millimeter Wave (MMW) Wireless InterCell Communication System (WICS) (page 10)									
6.2		6.3b							
Single Channel Ground and Airborne Radio Subsystem (SINCGARS) (page 14)									
6.3b									
SOS Frequency Synthesizer (page 14)									
6.2		6.3a							
VHSIC Phase 2 Chip Set (page 16)									
6.3a									

FCCV PROGRAM

C3I

: FY83:	: FY85:	: FY87:	: FY89:	: FY91:	: FY93:	: FY95:	: FY97:	: FY99:	: FY01:
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: CONCEPT PHASE									
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: COMP DEV-EXP PROTOTYPE									
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: VALIDATION-FSED-PLT									
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: FOLLOW-ON									
: VHSIC Phase 1 Chip Set (page 16)									
: 6.3a									
: Tactical Power Supplies (1.5 Kw TEG) (page 14)									
: 6.2	: 6.3a				: 6.3b			: 6.4	
: Adaptive VHF Radio Appliques for SINCGARS-V (page 6)									
: 6.2	: 6.3a								
: Armor/Air Covert Net (page 6)									
: 6.3a									
: Military Computer Family (page 10)									
: 6.2, 6.3b									
: 6.4									
: VHSIC Signal Processor Insertion in PJH/Advanced Communications Concept Development (page 16)									
: 6.3a									
: 500 Watt VHF Power Amplifier (page 6)									
: 6.3									
: Flat Panel Electroluminescent (EL) Display (page 8)									

FCCV PROGRAM

FIREPOWER

:FY83:	:FY85:	:FY87:	:FY89:	:FY91:	:FY93:	:FY95:	:FY97:	:FY99:	:FY01:
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/ 7 CONCEPT PHASE									
/COMP DEV-EXP PROTOTYPE			VALIDATION-FSED-PLT			FOLLOW-ON			
:	:	:	:	:	:	:	:	:	:
:MM Wave and Laser Command and Beamrider (page 41a)									
/ 6.2, 6.3a			:	:	:	:	:	:	:
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:Kinetic Energy Guided Missile (page 38)									
/ 6.3			:	:	:	:	:	:	:
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:VHSIC Fire and Forget Seeker (page 41k):									
/ 6.2 / 6.3a			:	:	:	:	:	:	:
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:Plume/Laser Unguided Missile Experiment (page 41c)									
/ 6.2			:	:	:	:	:	:	:
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:Low Volume Hypervelocity Missile Experiment (page 40)									
/ 6.2 / 6.3a / 6.3b			/ 6.4		:	:	:	:	:
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:Fog Processor (page 32)									
/ 6.1			:	:	:	:	:	:	:
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:Fiber Optics Guided Missile (FOG-M) (page 30)									
/ 6.3a			:	:	:	:	:	:	:
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FIREPOWER



FCCV PROGRAM

FIREPOWER

FY83:	FY85:	FY87:	FY89:	FY91:	FY93:	FY95:	FY97:	FY99:	FY01:
CONCEPT PHASE									
CCMP DEV-EXP PROTOTYPE			VALIDATION-FSER-PLT				FOLLOW-ON		
High Energy Explosives and Propellants/Formation of High Force Propellants (page 34):									
6.2		6.3a		6.3b					
Research in Physics of Armament (Composite Heavy Metal Penetrator Materials) (page 41e)									
6.2									
Synthesis of High Energy Explosives/Superenergetic Explosive Formulations (page 41i):									
6.2		6.3a		6.3b					
Composite Components for Armament (page 26)									
6.2/ 6.3a									
Improved 105-MM APFSDS-T (page 36):									
6.3a									
Consolidated Propellants for High Velocity Air Defense Round (page 28)									
6.2		6.3a		6.3b		6.4			
Conversion Coatings for Depleted Uranium (page 28)									
6.2/ 6.3a									
Mini-Startle (page 41a):									
6.3a		6.4							

FCCV PROGRAM

FIREPOWER

:FY83:	:FY85:	:FY87:	:FY89:	:FY91:	:FY93:	:FY95:	:FY97:	:FY99:	:FY01:
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/ 7 CONCEPT PHASE									
/COMP DEV-EXP PROTOTYPE /			VALIDATION-FSED-PLT				FOLLOW-ON		
:	:	:	:	:	:	:	:	:	:
:Minimum Signature Motor for Anti-Tank Application (page 41a)									
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FCCV PROGRAM

MOBILITY

:FY83:	:FY85:	:FY87:	:FY89:	:FY91:	:FY93:	:FY95:	:FY97:	:FY99:	:FY01:
/ CONCEPT PHASE									
/COMP DEV-EXP PROTOTYPE			VALIDATION-FSED-PLT				FOLLOW-ON		
:Combat Mobility Fuels (page 46)									
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:Tank-Automotive Tech/Engine Concepts for Alternate Fuels (page 56)									
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:Transmission Component Development (page 56):									
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:Corrosion Preventatives (page 48)									
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:/COMP DEV-EXP PROTOTYPE /			VALIDATION-FSED-PLT /			FOLLOW-ON /			
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:/ 6.2 / 6.3b :			:	:	:	:	:	:	:
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:M1 Abrams/M60 Track Improvement (page 52)									
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FCCV PROGRAM

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:Combat Vehicle Propulsion/1000 HP Transmission (page 46)									
/ 6.3a			:	:	:	:	:	:	:
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:Compliant Suspension System (page 46)									
/ 6.2 / 6.3a			:	:	:	:	:	:	:
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:M1 Abrams/M60 Track Improvement (page 52)									
/ 6.3a			:	:	:	:	:	:	:
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:Independent External Suspension (page 50)									
/ 6.2, 6.3a			:	:	:	:	:	:	:
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:20-40 Ton Track (page 42)									
/ 6.3a			:	:	:	:	:	:	:
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: Target Background Signature and Environments (page 78):	:	:	:	:	:	:	:	:	:
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: Chemical Alarm Tech (page 66):	:	:	:	:	:	:	:	:	:
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: ADDEV of Automatic Liquid Agent Detector, XM85, XM86 (page 60)	:	:	:	:	:	:	:	:	:
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: 6.2	:	:	:	:	:	:	:	:	:
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: 6.2	:	:	:	:	:	:	:	:	:
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: 6.2	:	:	:	:	:	:	:	:	:
: Multi-Environment Active RF Seeker Test Bed (page 74)	:	:	:	:	:	:	:	:	:
: 6.2	:	:	:	:	:	:	:	:	:
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CONCEPT PHASE									
COMP DEV-EXP PROTOTYPE			VALIDATION-FSED-FLT				FOLLOW-ON		
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6.2									
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6.2									

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<input type="checkbox"/> CONCEPT PHASE									
/COMP DEV-EXP PROTOTYPE			VALIDATION-FSED-PLT				FOLLOW-ON		
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Processors for Common Module FLIRS (page 76) <div></div>									
Multi-Function Laser Module Target Acquisition and Engagement (page 74) <div>6.2</div>									
Night Vision Auto Sensor Development (page 74) <div>6.2, 6.3a</div>									
Automatic Target Acquisition (page 64) <div>6.3a</div>									
Advanced Ground to Ground Target Acquisition Radar (page 62) <div>6.3a</div>									
M1 Mark III Night Sight (page 72) <div>6.2 6.3</div>									
ACV-L Remote Sensor Package (page 60) <div></div>									
Digital Turret Demonstration (page 66) <div>6.2</div>									

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:/COMP DEV-EXP PROTOTYPE /			VALIDATION-FSED-PLT				/ FOLLOW-ON		
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: / 6.3a :									
: Common Module Multifunction Laser (page 66) :									
: / 6.3a :									
: Advanced Radar Technology (page 62) :									
: / 6.2 / 6.3a / 6.3b/6.4/ :									
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: / 6.2 :									
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: / 6.2, 6.3a/ :									
: Wide Area Neutralization Device (WAND) (page 79a) :									
: / 6.2 / 6.3 :									
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SENSING

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CONCEPT PHASE									
COMP DEV-EXP PROTOTYPE			VALIDATION-FSED-PLT				FOLLOW-ON		
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RAM Hardening of Ranging Electronics (page 76)									
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Multi-Sensor Target Acquisition System (MTAS) (page 74)									
6.3a, 6.3b									
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6.2									
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6.2									

FCCV PROGRAM

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